



[From Erastus: *Varia Opuscula Medica*. Francofurdi, 1590.]

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THE HISTORY OF HEMOSTASIS*

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THE history of surgery is largely written in the record of its technical advances. The greater of these have led to the control of pain, bleeding and infection and without these techniques the progress of surgery in the past half century would have been impossible. The development of antisepsis and asepsis is still a matter of the memory of the present generation, and anesthesia, in origin scarcely two decades older, has been repeatedly reviewed by those who had to do with its birth. Hemostasis, on the contrary, has been a matter of slow growth, keeping pace with the advancing knowledge of anatomy and physiology and reaching its present-day perfection in conjunction with anesthesia and asepsis. It has received but

fragmentary and casual historical consideration.

The flow of blood following a wound is a phenomenon, the importance of which is apparent even to many animals. In attack, certain points at which to strike are selected instinctively and in defense likewise such areas are protected. However, any process of ratiocination directed toward the induction or control of hemorrhage is scarcely to be expected, though Pliny, the younger, credited the hippopotamus with such intelligence that it bled itself by thrusting a hollow reed into a vein. It may be more readily believed as stated by Neuberger "that monkeys seek to check the flow of blood by applications of the paw."

Although primitive man may have had no clearer notion of the phenomenon of bleeding than his progenitors, it excited his interest as did anything unusual about himself or about his

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environment. When the hunter slew his game or the warrior his foe, death came quickly when the purple tide freely flowed and as the dark blood clotted the spirit fled from its earthly abode. With the primitive man's crude reasoning by association, blood became the expression of the ghostly dangers with which he was hedged about and a starting point for magic, taboo and myth. So, according to Moses:

The priest shall sprinkle the blood upon the altar of the Lord at the door of the tabernacle of the congregation, and, whatsoever man hunteth and catcheth any beast or fowl that may be eaten; he shall even pour out the blood thereof, and cover it with dust. For it is the life of all flesh.

The apotheosis of superstition was reached in the ritual of Attis at Rome which Frazer, in "The Golden Bough," describes as follows:

In the baptism the devotee, crowned with gold and wreathed with fillets, descended into a pit, the mouth of which was covered with a wooden grating. A bull, adorned with garlands of flowers, its forehead glittering with gold leaf, was then driven on to the grating and there stabbed to death with a consecrated spear. Its hot reeking blood poured in torrents through the apertures, and was received with devout eagerness by the worshipper on every part of his person and garments, till he emerged from the pit, drenched, dripping, and scarlet from head to foot, to receive the homage, nay the adoration, of his fellows as one who had been born again to eternal life and had washed away his sins in the blood of the bull.

This superstitious respect for blood so thoroughly enmeshed science and surgery with the black thread of magic and the red skein of religion, that a

thousand years was scarcely sufficient to disentangle them.

Nevertheless, the exigencies of warfare, of the hunt and of daily toil, made necessary some attempt at hemostasis. The epics of early Greece and Rome portrayed again and again the fleeting of the vital spirits with the pouring out of the blood and attempts were made to prevent this. When Menelaus was shot through the belt, the treatment was as follows: "The godlike hero Machaon drew then forth the arrow from golden haired Menelaus and sucked out the blood from the wound and cunningly spread thereon soothing drugs, such as Cheiron of his good will had imparted to his son."

In the Aeneid:

Venus for her darling filled with grief
A stalk of dittany of Ida's crown
Seeks out, and gathers, for his wound's relief,
The flower of purple and the leaves of down.
(To wounded wild-goats 'twas a plant well-known).

This brings the Goddess, veiled in mist, and brews

In a bright bowl a mixture of her own,
And, steeped in water from the stream, she strews

Soft balm of fragrant scent, and sweet ambrosial dews.

Therewith the leech, unwitting, rinsed the wound,

And the pain fled, and all the blood was stayed.

In a general if poetical manner, this portrays the degree of knowledge of the Greek of the Homeric period and corresponds to that employed by uncivilized man in various parts of the world today. According to Neuberger: "Arrest of hemorrhage presents great difficulties to aborigines, for the most part they do not know how to attack it. It is sometimes brought about by means of vegetable and mineral styp-

tics, less often it is attempted by means of circular pressure (tightly bound bandages)."

When the Greeks, as recounted in Herodotus, encountered Egyptian medicine, it was in its decline, probably having reached its zenith some 1300 years previously. The Ebers' Papyrus described operative procedures in which the danger of hemorrhage was recognized. "When thou feelest a fatty growth in the neck and feelest it like an abscess of the flesh and soft to the fingers, then sayest thou, 'He has a fatty growth on his neck, I will treat the disease with the knife, paying heed to the vessels.'"

They also employed as medicaments lead sulphate, antimony, verdegis and copper sulphate, the last of which we shall recognize later as the "hemostatic button." In India, venesection was practiced and bleeding was controlled by elevation, cold, compression, and hot oil. Among the Chinese, hemorrhage was arrested by styptics and bandaging. All the civilizations in the first millennium before Christ—the Chinese, the Indian, the Assyrio-Babylonian and the Egyptian—were at much the same level as regards surgery and in particular the control of hemorrhage. The progress of further knowledge was blocked by oriental formalism and mysticism, and as Albutt says, it remained for the "lucid and positive intelligence of the Greeks to transfer this into unimportant mythology and to apply the rational mind to the study of Medicine."

Alcmaion of Crotona, a contemporary of Pythagoras, distinguished in the cadaver between empty veins and veins containing blood; and Diogenes of Appollonia (ca. 430 B.C.) was

among the earliest to describe blood vessels but supposed that they carried air to the different parts of the



FIG. 1. CASES CONTAINING SCALPES AND TENACULUM. BLEEDING CUPS ON EITHER SIDE. PRE-HIPPOCRATIC MONUMENTAL CARVING. (FROM SUDHOFF-MEYER-STEINEG.)

system. He did not recognize the heart as the starting point of the vessels. These, the first gropings of the pre-Hippocratic group, come down to us through Aristotle, for their writings, apparently voluminous, have otherwise disappeared.

In the corpus Hippocraticum, which was written in the main between 400 and 300 B.C. the: "blood is the chief material from which organs are built up; it is produced in the liver and obtains the necessary temperature in the left ventricle. From there propelled by the pulsating heart, it circulates by means of the veins throughout the entire body." The content of the left ventricle and of the arteries was supposed to be either *pneuma* alone or principally *pneuma* with only the smallest particles of blood. The proof of this was the emptiness of the left ventricle at death, the hissing sound when an artery was sectioned, and the steaming of the blood as it poured out upon the ground. This unfortunate doctrine of the *pneuma*, hypothecated by

Empedocles and Pythagoras among others in an effort to find some method of circulation for the spirit

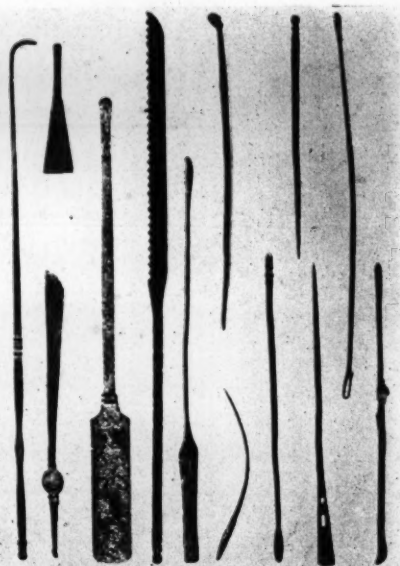


FIG. 2. SURGICAL INSTRUMENTS OF HIPPOCRATIC TIMES. TENACULUM ON LEFT. (FROM SUDHOFF-MEYER-STEINEG.)

of life itself, was passed onward through Aristotle and Galen, until it became the "quintessence" of Harvey, the "phlogiston" of Black and the "oxygen" of Lavoisier; finally leaving the name "artery" as a lone relic of a discarded philosophy. It is not surprising to find that the Hippocratic operations were largely those which could be performed without hemostasis. Ligation of vessels was unknown and amputations done only through the gangrenous extremity below the zone of demarcation. Such means as were used for controlling accidental hemorrhage were various styptics, elevation and compression, tamponage and bandage and infrequently the cautery.

The reasoning mind of the Greek

followed the Alexandrian armies into Asia Minor, Egypt, and as far abroad as the Punjab; and Ptolemy founded the Alexandrian library, drawing there the best of Greek culture including that in medicine and surgery. The custom of embalming, a religious rite, had made the Egyptians familiar with dissection of the human body. It was but a short step from this to purposeful dissection and the first respectable knowledge of anatomy was acquired at this time. Herophilus: "with great care described the course relationship of the vascular system and distinguished the blood conducting veins from the arteries, filled with blood and pneuma, which arose from the heart and possess coats six times as strong." Erasistratus described the heart with its valves and *chordae tendineae* and thought that the arteries (containing pneuma) had their origin in the heart: "From the liver where blood first comes into existence, it is conducted into the venae cavae and is distributed by the way of the venous system." He also hypothesized the capillary circulation as "synanastomoses" which under normal circumstances were closed, though when an artery was cut, blood might penetrate through these into the arterial circulation, following the escape of the pneuma, the response being due to the law of *natura abhorret vacui*. Hemorrhage then did not come directly from arteries, but indirectly through the "synanastomoses" and arrest of bleeding consequently might cause a plethora in the arterial system, a supposedly undesirable thing. The pneuma of the philosophers still befogged the observations of the anatomists and: "bombastic plausibility and craziness flaunting as erudition, in the end won

the day against the homely truth of plain hands and honest eyes." The momentary brilliancy of Alexandria was soon obscured by pedantic erudition and by oriental mysticism drifting in from the East.

"After the destruction of Corinth (146 B.C.)," as Garrison says, "Greek medicine . . . migrated to Rome," where the atmosphere of pragmatic practicality seems to have served surgery well. From this time, until Galen, (some three hundred years) was a golden age in surgery, but unfortunately the literature of it is in large part extinct and dependence must be had upon the compilations of Celsus, Oribasius, and Paul of Aegina, with argumentative references in Galen. Celsus advanced beyond the Hippocratic doctrine to the point of amputation at the line of demarcation, where in most instances the vessels would be already occluded. Even at that, in *upso opere, vel profusione sanguinalis, vel animae dejectionae moriuntur*. While not using the ligature in the amputation stump, he did propose the pulling up of the vessel in a wound, ligating it on either side of the injured point and completing the division, although he recommended the trial of compression and styptics first. Ligature was then a matter of last resort and not of election and the use of it probably infrequent and confined to accidental wounds. Heliodorus used a bandage about the limb above the site of amputation in order, so far as possible, to bring about the closure of the vessels. He described amputation through the lower leg but it is doubtful if he carried out any amputation of election above the knee or elbow.

Archigenes (ca. 100 A.D.) was more daring and advanced the scope of

practice materially. He proposed amputating in: "gangrene, necrosis, cancer, and certain callus tumors."

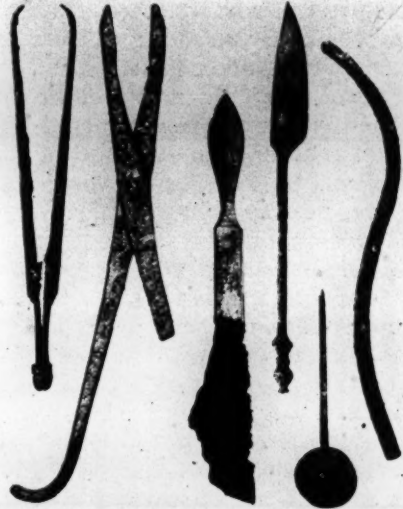


FIG. 3. SURGICAL INSTRUMENTS OF EARLY ROMAN TIMES. ON LEFT A DEPILOTOR AND DIRECTLY ADJACENT FORCEPS FOR DRAWING TEETH. (FROM SUDHOFF-MEYER-STEINER.)

As a preliminary he suggested that the vessels leading to the site of amputation be tied, bound or sewn but it is doubtful if this meant ligation of arteries in continuity. The knowledge of the anatomical landmarks of the great vessels was too indefinite, the veins were supposed to contain the blood and the arteries only pneuma and a double operative procedure would have been improbable. The soft parts were retracted, the skin first, then the "tendon" so as to give a properly covered stump. The cautery and the usual styptics were applied to control bleeding.¹ Soranus,

¹ There seems to be a considerable confusion concerning the practice of the time in this respect. Garrison says: "Heliodorus, who antedated Celsus, gave the first account of ligation and torsion of blood vessels." It is not usually stated that Heliodorus did ante-

who wrote greatly on obstetrics, gynecology and pediatrics, recommended the division of the cord by the knife and the use of the ligature if the placenta was still attached. Rufus of Ephesus, a few years preceding Galen wrote in the same sense as Archigenes, recommending the arrest of hemorrhage by digital pressure, pressure with bandages, cold, astringents, torsion and ligature, and severance of incised vessels. With the ligation of vessels in a wound the application of a similar procedure to aneurysm by Antyllus was but a natural step. He described the occurrence of both the spontaneous and the traumatic aneurysm and recommended the ligation on either side of the tumor and the evacuation of its contents by incision. That this could have been successfully applied to the large

date Celsus, for he is mentioned by Juvenal and has been supposed to have been contemporaneous with this author (ca. 100 A.D.), while Celsus wrote nearly one hundred years earlier. He recommended the ligation and torsion of vessels (after excising the dartos) in operating for hernia and not in the operation of amputation. In this respect he was in entire accord with Celsus who probably did not practice but was an unusually able compiler and who described the same methods of handling hemorrhage in accidental wounds. In all probability the introduction of the ligation of damaged vessels was a matter of the Alexandrian school for the corpus Hippocraticum has nothing to say of it.

Allbutt, as well as other recent writers, has stated that Archigenes used the ligature in amputation. This seems to have been based upon the section in Oribasius which was copied from the writings, long since vanished, of this remarkable surgeon. The original Greek is difficult of translation but probably referred to types of bandages applied above the amputation site to compress the veins rather than to ligation in continuity or in the stump as has been assumed by some. Certainly the tourniquet was not used as has been suggested.

aneurysm with its many and large collateral vessels running directly into the sac is improbable and indeed this author, as well as Galen, advises against the attempt in tumors of the groin, axilla and at the base of the neck.

The period in which these men worked, a matter of three hundred years, was the golden age of Rome so well described by Gibbon, in the opening chapters of the "Decline and Fall." It was a period of opulence and power for the few, of poverty and degradation for the many, but withal a time of freedom of thought insofar as it did not conflict with the political hegemony. For the medical sciences it was the second day of light and growth flaring out at the last in Galen.

As a philosopher, Galen dispersed the pneuma of Erasistratus but succeeded in fixing vitalism on medicine until the present day; as an anatomist he systematized and amplified the anatomy of Alexandria but derived his knowledge from animals, not men; and as a compiler he brought the medical knowledge of his time into an encyclopedia, including the surgery of Antyllus, Soranus, Rufus and Archigenes. As a physiologist, he showed by means of vivisection that the arteries contained blood and not air and missed the correct description of the circulation and the true action of the heart by a narrow margin. Though his description and practice in surgery are detailed and precise, it is probable that he actually did but little surgery. As regards the control of hemorrhage he was dependent upon the work of his immediate predecessors. When blood was discharged from a wounded artery, a finger was applied to the orifice of the vessel firmly, yet not so as to occasion pain, and then a thrombus would form

that would stop the flow of blood. When the vessel was deeply seated he advised one to examine accurately into the situation and size and to ascertain whether it was an artery or vein; after which it was to be seized with a hook and twisted moderately. If the flow of blood was not stopped thereby, and if the vessel was a vein, an endeavor was made to restrain it without a ligature by means of styptics or things of an obstruent nature such as roasted rosin, the fine down of wheat and flour, gypsum and the like. But if the vessel was an artery, one of two things must be done: either a ligature must be applied to it, or it must be cut across. As a ligature, he recommended Celtic linen, probably obtained from Scotland and named the shop in the Via Sacra in which it might be bought. Although completely familiar with ligation in the accidental wound, he did not mention its use in amputations. In fact his descriptions of this procedure were without detail.

After Galen, as Albutt says, "begins the night"—a long one—"of the second day." He died at the close of the second century shortly after the exitus of his patron, the flower of the Emperors, Marcus Aurelius. Within a little over one hundred years, a century of internal dissension, superstition and fanaticism, the great persecution of Diocletian had failed and Constantine officially Christianized the Roman Empire. With the apostasy of Julian and perhaps as a result of his furore for Paganism, Oribasius wrote his compendium of the medicine of antiquity from which most of our information back as far as the corpus Hippocraticum is derived. This was but a flash and the overturning of the Western Empire by the barbarians

and the domination of the Eastern Empire by Byzantine courtiers and religious fanatics put an end to all advance in medicine. Gregory the Great became the first pope in 590 A.D. and the church assumed complete control of all thought. Aetius of Amida and Alexander of Tralles in the sixth century and Paul of Aegina, in the seventh century were compilers, to whose originality we owe nothing but who with Galen were carried over into the Arabian school and there served to link the middle ages with antiquity. In the surgery of the blood vessels they did little but quote the ancients and in the compilations of Paul of Aegina, it is apparent that the standards of practice had made no advance since the first century.

Meanwhile the strife within the church was bearing its fruit. Nestor, the patriarch of Constantinople, had been deposed in 428 A.D., and driven first to Edessa and later into Persia. The Nestorians carried with them the yeast of Greek culture which leavened the great Arabian movement and found its way across Egypt, Northern Africa, the Straits of Gibraltar, through Cordova and at last, in the tenth century, into Italy. Johannitus, "the Erasmus of the Arabic renaissance" in the ninth century translated Hippocrates, Galen, Oribasius and Paul into Arabic and therewith formed the groundwork for Rhazes, Avicenna and Albucasis, the great compilers and practitioners of Arabian medicine.

These men, in surgery, did little but apply the sayings of the ancients and in particular this is true of hemostasis. The measure of their prowess is found in Albucasis (eleventh century) whose text was authoritative in western surgery until the

time of Guy de Chaulliac, or the middle of the fourteenth century. Surgery had become an inferior

fire extermineth." In every treatise the cautery was recommended when everything else failed and such was

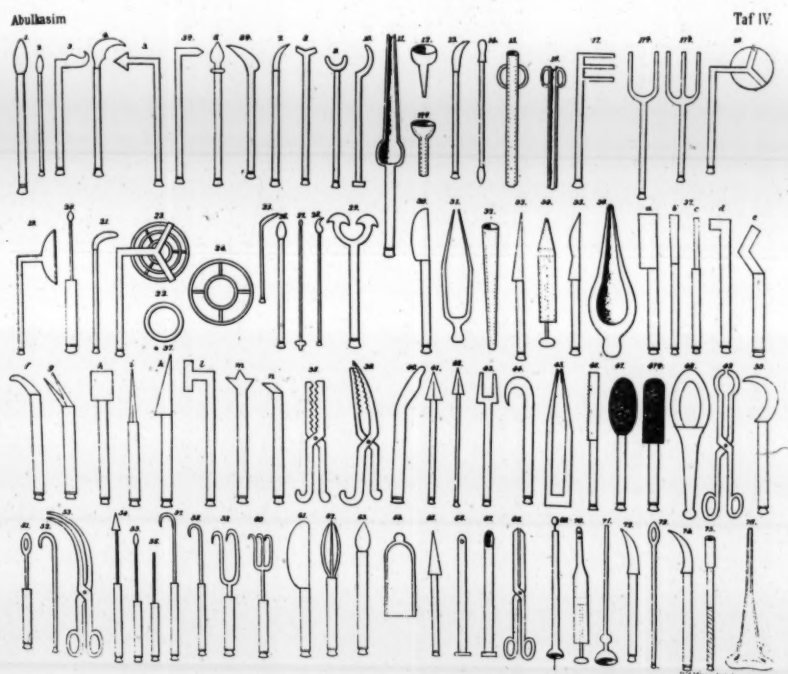


FIG. 4. SURGICAL INSTRUMENTS AS ILLUSTRATED IN ALBUCASIS. MANY CAUTERIES OF VARYING FORMS. 31 AND 45 ARE DEPILATION OR TISSUE FORCEPS. 38, 39 AND 53 ARE DENTAL FORCEPS ADOPTED FOR REMOVAL OF FOREIGN BODIES. 53 IS "BEC DE CORBIN" OF PARÉ. (FROM GURLT.)

and separate branch of medicine, as implied by Avicenna and the cautery had in large part replaced the knife. True, the ligation of vessels was advised by Paul—Paré used Avicenna as an authority for his method—but cauterization was the common procedure, refined in its cruelty and explicit in its application. It is somewhat difficult to understand this depreciation.

The practice of cauterization had derived authoritative support from Hippocrates and Galen. According to the former: "that what the medication quelleth not, the iron doth; and that which the iron amendeth not, the

usually the situation at once in amputation. It was not within the province of the oriental mind to question such dicta. That same mind was warped by the taboo of the East as regards defilement by contact with the body or with the blood. Surgery degraded by this superstition—in fact, as a profession, largely wiped out—was confined to the treatment of wounds. Anatomical knowledge and manual dexterity were in abeyance and when most needed were lacking. Anyone could apply the cautery, practically no one the ligature.

Albucasis had this to say concerning the control of bleeding in a wound:

Arterial hemorrhage is frequently seen following the rupture of an artery in wounds from external causes, in the opening of a swelling, in the cauterization of an organ and in other similar circumstances. If you find yourself in this situation, apply promptly the hand over the opening in the vessel, press with the index finger until the blood is stopped under your finger and flows forth no more. Put on the fire an assortment of olivary cauteries and blow upon them until they are well heated. Take one of them, large or small, according to the size and shape of the part where the artery is ruptured. Apply the cautery on the artery itself, after having quickly raised the finger and hold it there until the bleeding is stopped.

As regards amputation, he performed it only as high as the elbow or knee. He says: "if during the operation an hemorrhage occurs, cauterize promptly or apply an hemostatic powder." Otherwise the procedure differs in no way from that of the ancients.

Saracen culture was then in considerable part responsible for the backwardness of surgery in the west and its influence lasted for some five centuries. The educated class in Italy and in France were in large part ecclesiastic, that is to say scholastic, and spent its time arguing, like Abelard, for Platonic nominalism or like St. Thomas Aquinas for Aristotelian realism. Logic was chopped, sophistry was knowledge, and observation and trial by experimentation unknown. The use of the hands except for the gestures of oratory was undignified and operative skill was the property of the itinerant quack who became so great an evil that all surgery, except that done by clerics, was wisely forbidden. However, the shedding of blood, a mystery of Attis as described previously, had curiously

interwoven itself with the mysticism of the early church so that it soon became taboo in the only class which was qualified by knowledge to carry it out. The council of Tours in 1163 promulgated the doctrine *ecclesia abhorret a sanguine* and surgery was at an end in the educated class and interdicted among the uneducated. It is not surprising then that it remained largely a matter of the treatment of wounds and that the control of hemorrhage followed faithfully the methods laid down in the Arabian texts.

There came after a time, however, certain independent minds, who learned from observation, such as Hugh of Lucca and his pupil Theodoric who believed in healing *per primam* and used the suture and ligature in hemorrhage. Saliceto in the early thirteenth century restored the use of the knife and diagnosed arterial bleeding by the spurting of the blood. Lanfranc, the father of French surgery in the latter part of the same century, differentiated arterial from venous bleeding and treated hemorrhage by styptics, compresses, torsion and even the ligature. He was in the main, however, a cauterist; in fact, the more of a scholar the greater the use of the cautery, was in general the rule. Henri de Mondeville, of the same period, but more educated by his hands felt that "God did not exhaust all the creative power in making Galen" and used styptics, digital compression, acupressure, torsion and ligation of isolated vessels by means of a sliding noose ligature. The importance to the surgeon of anatomy had again begun to be recognized, for Guy de Chauliac said that the surgeon ignorant of anatomy, "carves the human body as a sculptor carves wood." So dis-

section was started at Montpellier and Mundinus wrote the first anatomy in 1316.

lations from the Arabic, and the Mundinus anatomy appeared in 1473. Guy's surgery went into many editions

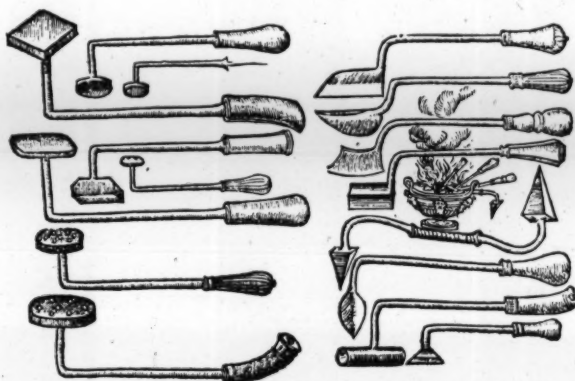


FIG. 5. CAUTERIES AS ILLUSTRATED BY PARÉ. (FROM GURLT.)

The fifteenth century is notable for many things including the popularization of the use of gunpowder and the development of the art of printing. Marcello seems to have been first to write of the treatment of gunshot wounds, while a confrère, Leonardo Bertopaglia, a professor at Padua, investigated the indications for and the methods of application of the ligature. He drew the vessel forward with a steel hook, isolated it and tied it with a flaxen thread, twisting the thread first, to make fast the knots. He sutured wounds of the intestine with a glover's stitch and used softened catgut in preference to thread for the purpose, a method recommended previously by Rhazes. He did not, however, apply it in amputations. It must be remembered that such knowledge as these men had was acquired by very rare, incomplete and hasty dissections and by the perusal of frequently copied manuscripts. With the advent of printing, knowledge became at once much more universal and accessible. The classics were printed, particularly the trans-

lations from the Arabic, and the Mundinus anatomy appeared in 1473. Guy's surgery went into many editions and became widely distributed. John of Vigo (1514) wrote the surgery of this time, authoritative particularly in regard to gunshot wounds. Amputation for injury was described, still with the use of the cautery, while the ligature was applied only in the manner of Celsus. Gunshot wounds were poisoned "a priori" and Ambroise Paré attempted to carry John of Vigo's methods into practice.

Paré was untrained in the classics. Indeed, it is doubtful if he could read anything but the vernacular. He derived his knowledge by dissection and by service as a dresser in the wards of the Hôtel Dieu and as a surgeon on the battlefield. He broke away from servility to tradition and allowed his keen and untrammelled intelligence to carry him into new practices. Of chief interest here is the development of his methods in the control of hemorrhage.

In 1537 when Paré received his baptism in war surgery there seemed many cogent reasons for the cauterization of wounds, either by hot oil or by the use of the actual cautery.

All the ancients agreed upon this procedure. It was assumed that all gunshot wounds were poisoned and

For fifteen years afterward he must have been turning over in his mind the possibility of likewise avoiding

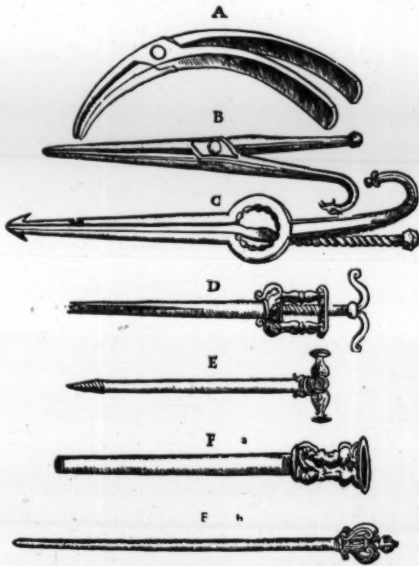


FIG. 6. SURGICAL INSTRUMENTS OF PARÉ. A IS "BEC DE CORBIN" WITH WHICH HE GRASPED BLEEDING VESSEL IN ORDER TO LIGATE IT. (FROM GURLT.)

that the natural process was toward gangrene. As Paré says: "They partook of a venomous nature." However, he in his first war experience was soon pressed for lack of the particular oil in use and was forced to dress the wound with a "digestive" of the yolk of eggs, the oil of olives and turpentine. He says:

That night I could not sleep at ease, fearing by lack of cauterization, that I should find the wounded, on whom I had failed to put the said oil, dead or empoisoned, which made me rise very early to visit them. When beyond my hope, I found them upon whom I had put the digestive medicament feeling little pain and their wounds without inflammation or swelling having rested fairly well throughout the night. Then I resolved with myself never more to burn thus cruelly poor men wounded with gunshot.



FIG. 7. FIRST ILLUSTRATION OF AMPUTATION, FROM VON GERSDORFF (1517). BANDAGES CONSTRICT, AT MOST, SUPERFICIAL VEINS. TWO ARTERIES ARE SPURTING UNCONTROLLED. MAN IN BACKGROUND IS WEARING GERSDORFF'S PIG'S BLADDER DRESSING OVER HIS FOREARM STUMP.

the use of the cautery in amputations. Meanwhile he persistently continued his dissections and in 1549 published a small anatomy. He was well aware of the statements of the authorities as regards the ligation of vessels in wounds but scarcely dared extend the method to amputations. At last in 1552, he amputated the leg of an officer who had been wounded at the siege of Danvilliers, using the ligature instead of hot irons to check the hemorrhage. "I dressed him and God healed him. He returned home gaily with a wooden leg, saying that he had

got off cheaply without being miserably burned to stop the bleeding."

After this performance the next



FIG. 8. AMPUTATION AS DEPICTED BY FABRICIUS HILDANUS (1593). ASSISTANT IS USING COMPRESSION BANDAGE ABOVE INCISION FOR RETRACTION OF STUMP. IRONS WHICH FABRICIUS RECOMMENDED FOR AMPUTATION ARE AT HAND IN CHARCOAL SALAMANDER.

edition of his "Dix Livres de la Chirurgie" which appeared in 1564 advised the abandonment of the cautery altogether. Twenty years later Etienne Gourmelen, dean of the faculty of medicine of Paris, made himself famous by virulently attacking this procedure and to him we are indebted for Paré's delightful rejoinder, the "Apology and Journeys." In this we learn considerably more concerning his practice. He amputated above the portion mortified and corrupted, returning to the practice of Archigenes. He thought it not necessary: "to use fire—to consume and check the putrefaction which is common to gangrenous mortifications." He drew the bleeding vessel forth by grasping it with a "bec de corbin" (a bullet grasping instrument), which therefore became the true ancestor of the artery forceps. Previously vessels had been handled with a hook or tenaculum, and then only in wounds and not in amputation stumps. Now for the first time a vessel was caught

with a pinching instrument which would control the bleeding while it was being handled. He gave five case histories, in which the ligature was used, four of amputations below the knee and one probably below the elbow. He ligated *en masse* but the material of the ligature was not mentioned or whether he cut the thread short or left it hanging from the wound.

The adoption of Paré's suggestion was far from immediate, although his opinion was frequently quoted and tentatively recommended. Even his pupil Guillemeau (1602) adopted a middle attitude between "les deux grands personnages de nostre temps, l'un medecin, l'autre chieurgien" and reserved the ligature for amputation through healthy tissue. Where the incision was carried across vessels that might be diseased he feared that the ligature would cut through and employed the cautery. In general, he agreed with Paré that amputation should be carried through healthy tissue above the diseased portion of the limb. Fallopius (1606), the teacher of Harvey at Padua, thanked God that he had the audacity to use the ligature in the control of hemorrhage but his daring did not carry him as far as amputations. In his description of this operation he recommended the use of the cautery. Fabricius ab Aquapendente, in the "Pentateuch" (1617) did not mention the use of the ligature whereas Dalechamp (1573) briefly called attention to Paré's procedure with no comment as to its effectiveness. Rauchin (1580) in a similar treatise recommended Paré's procedure without giving credit for it. Schenck (1643) gave impartially Paré's description and Gourmelen's criticism. His was a compilation of

previous writers, the product of a scholar and not that of a practitioner in surgery.

Fabricius Hildanus (1615) in the standard German text of his time wrote a classical description of amputation with no reference to Paré's method. Sennert in 1620 mentioned Paré's method only to condemn it and summed up the objections in a similar manner to Gourmelen—the procedure was difficult, time consuming and dangerous and that when accomplished it led to fever, with the additional danger of puncturing the adjacent nerve which would result in convulsions and great danger to life.

The primary determining factor at this period as to the use of the ligature was the type of amputation employed. As we have seen, many of the great writers recommended amputation according to the Hippocratic method, that is, through the diseased tissues. Others suggested the method of Celsus, which was carrying the amputation through or adjacent to the line of demarcation. Relatively few, of whom Archigenes and Paré were notable examples, advised amputation above the diseased portion of the limb and through healthy tissue. It is apparent that the latter group would find the control of hemorrhage with the cautery difficult and would naturally tend to use the ligature, while the former group would have less difficulty because the vessels would be frequently already thrombosed.

In the English literature, Thomas Gale (1563) does not refer to ligature of the vessels but Clowes (1596) who wrote in French, but of whom an English translation appeared in 1637, quotes Guillemeau, Paré's pupil, in favor of ligation. He, however, adds: "I have practiced this order by

attaching the veins and arteries. I will leave it as aforesaid and proceed with mine own approved practice."



FIG. 9. INADEQUATE DEPICTION OF ANATOMY OF PERIPHERAL VESSELS, 14TH OR 15TH CENTURY. (FROM OSLER'S "EVOLUTION OF MODERN MEDICINE.")

Lowe (1597) says: "cut rather a little of the whole, rather than leave any portion of the infected—where there is no putrefaction, malignancy nor humor venemous we use the ligator." Lowe practiced surgery for twenty-two years in France and Flanders, and for two years was surgeon major to the Spanish regiments in Paris (1589-90). From 1596-98 he was in London and in the latter year founded the School of Medicine in Glasgow. His "A Discourse of the Whole Art of Chyrurgery" London, 1596, represented the first adequate description in English of the best of the French practice. In regard to amputation he says:

I advise to make the incision four inches from the joynt in all amputations, except only when the mortification on riving of the bone end in the joynt, then it must be cut in the joynt, chiefly the joynt of the knee; always it is hard to cicatrize and heal, by reason the end of the bone is spongius and humid, so the loather to conglutinate; but wheresoever you make your amputation, remember to mark it well with ink or others, and to cut rather a little of the whol, then to leave any

portion of the infected. If any of the infected remain, it corrupteth the rest, and so requireth new amputation, as I have often seen . . . the chyrurgion shall pluck up the skinn and muscles as much as he can, thereafter he shall take a strong ribbon, and binde the member fast about the place of the member, two inches abowe where the amputation shall be . . . we cut the flesh with a razor or incising knife, which must be somewhat crooked though the form of a hook or half moon . . . The flesh then being so cut to the bone, the said bone must be diligently rubbed and scraped with the back of the sayd knife, which back must be made purposely for that effect, to the end of the periost which covereth the bone, may be lesse painful in cutting of the bone. Otherwise it teareth and riveth with the same, so causeth great dolour; Also letteth the cutting, although the bone hath no feeling of itself. This being done, you must saw the bone with a sharpe sawe; then loose the ligatour, draw down the skin, and cover the bone in all the parts; and if there be great putrefaction, let it bleed a little, for that dischargeth the part and so is lesse subject to inflammation: then one of the assisters shall put the extremitities of his fingers on the great veins and arteries, to stay them from bleeding, till the chyrurgion either knit or cauterize them one after another, as he shall think expedient. But where there is putrefaction, we stay the flux of blood by cauters actuals, and where there is no putrefaction, malignitis, nor humor venemous, we use the ligator. The cauter or actuall fire maketh scale, stayeth bleeding, consumeth and draweth into it the virulency and malignitis of the humor which is in that part, and in that point it is more sure and better than knitting. In knitting we lose much blood, and by drawing the veins with back decurbing, or other instrument, they doe breake. Also being knit, doe often unloose, so that I find the fire more expedient, being done and applyed meanly. Then to doe it, we must have three or foure little instruments of iron, crooked at the end,

with a point in form of a button; of which, some be round, some silate, and some broad, to rub on the end of the bone . . . It hath the virtue to dry and corroborate the same, being made red hot: then we take eyther of them and apply on the veines one after another, continuing them a certain space till the scale be made, taking heed alwaies not to burn overmuch of the vein . . . In amputation without putrefaction, I find the ligator reasonable sure, providing it be quickly done. To doe it first thou shalt cause the assister as I have said, to hold his fingers on the veines, letting one loose, on the which thou shalt take hold with the back decurbin, taking a little of the flesh or muscles with it; then put through a needle with a strong thread, knit with a double knot, tying a little of the flesh with the veine, which will make it hold the better: but if it slip, as oft it happeneth, you shall first put through the needle in the utter skin, an inch above the wound, neere to the side of the vein, cause it to come forth by the other side of the vein, yet higher than the orifice of the veine: then pul out your needle an inch from the part where it went in, then put a piece of cloth in two doubles betwixt the two threads, then tye it hard, to the end the knot enter not in the skinne. This way and forme must be used in the rest of the veines, as also in divers other parts of the body."

Woodall in 1639 advocated the amputation "in the rotten part" saying that he had not lost a single patient of 100 so treated nor had the "mortification spread itself any further at all." It was of course not necessary to use the ligature.

The civil and religious discords of the seventeenth century in Germany, in France and in England seem to have held the advancement of surgery in abeyance. From Fabricius Hildanus to Petit no great name occurs among the surgeons and the work of the former remained the standard of prac-

tice for this time, being quoted by all authors even into the early part of the nineteenth century and serving in the

1655) enabled the anatomist to distinguish them from other structures aiding greatly in their accurate dis-

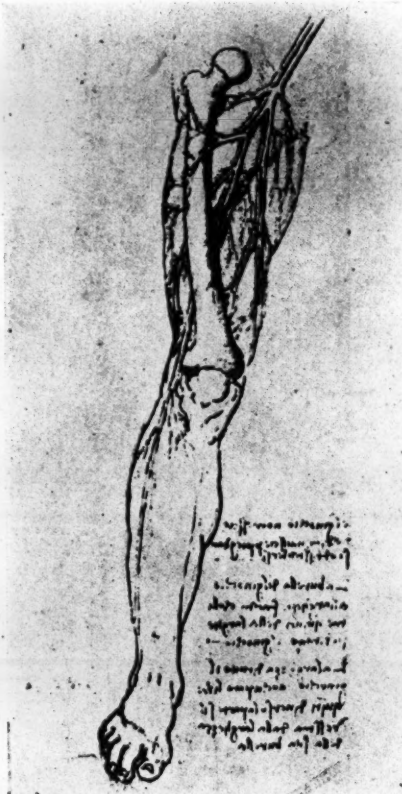


FIG. 10. DRAWING OF LEONARDO AFTER INJECTION OF VESSELS. DEPICTION IS STILL INADEQUATE AND CONFUSED (15TH CENTURY).

German as a common text for the "Wund Arzt" until the time of Heister (1724). Meanwhile the basic sciences were thriving and particularly anatomy with its physiological correlations. The "De Motu Cordis" (1628) established the circulation of the blood and the exact distribution and relation of the arteries were shortly worked out. The fine copper plates of a little later (Bidloo, 1685) added to their exact delineation and refined methods of injecting vessels (Ruysch,



FIG. 11. THE "BEC DE CORBIN" APPLIED AS ILLUSTRATED BY GUILLEMEAU (1585). IT HAS BEEN PROVIDED WITH SPRING.

section. It was only a short step forward to the first modern text on anatomy, that of von Soemmerring (1791-96).

The "ligatures" of Archigenes and Heliodorus were still used to control the superficial vessels (veins) and to numb the skin. They consisted of narrow bands of cloth placed directly above and below the line of incision, whipped two or three times about the limb and tied in a single knot. The first picture of an amputation, that of von Gersdorff, shows how ineffectual this was, for the two tibial arteries appear spurting forcibly from the stump through such a ligature or bandage. It was necessary to act hastily before the patient became exsanguinated, particularly in amputation of the larger extremities. To grasp a large vessel with the clumsy "bec de corbin" of Paré, to draw it out and transfix it with needle and thread and then tie, required a precision of movement and a manual dexterity which was probably not common. In clumsy hands the patient might die before the several vessels were successfully ligated. Consequently when Paré's method was advocated, it was directed that an assistant should control the other vessels by direct pressure in the wound, thus necessitating the presence of a second person to perform a necessarily clumsy and inefficient task.

Some time in this period, it is difficult to say when or by whom, it was discovered that compression

bleeding. Morel in the siege of Besançon (1674) was, as far as can be determined, the first to introduce a

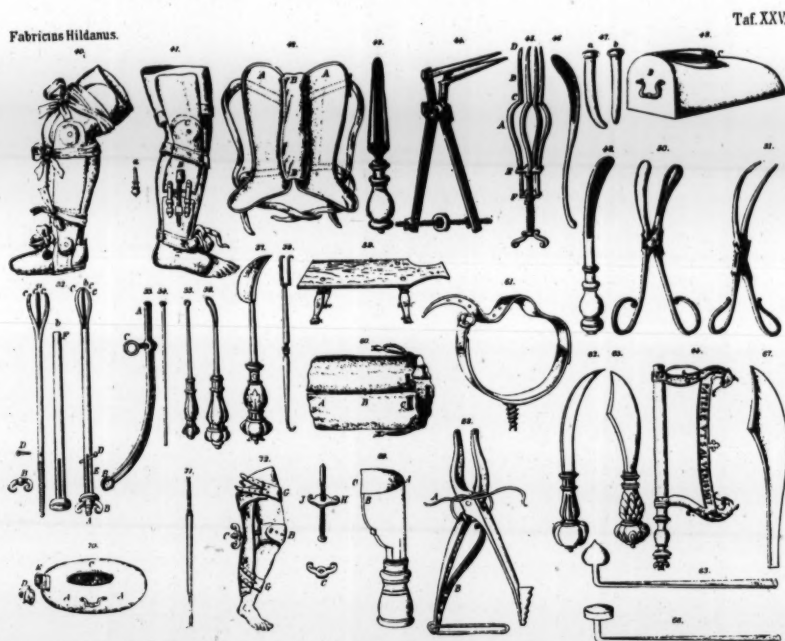


FIG. 12. SURGICAL INSTRUMENTS OF FABRICIUS HILDANUS. 68 REPRESENTS "BEC DE CORBIN" ALSO PROVIDED WITH CATCH AND ITS USE INDICATED BY LIGATURE CAST LOOSELY ABOUT IT.

applied over the great arterial trunks, proximally at some distance from the site of amputation, would control bleeding. The accurate localization of these vessels had now become known and was a matter of common knowledge to the well informed surgeon. Both Paré and Wiseman had mentioned the possibility of control by manupressure but added that this was ineffective because of the strength required. This application was not directed at precise digital control but general compression which could not be long maintained. There was then no effective temporary method of hemostasis and whatever procedure was applied had to be carried out in the presence of active

stick into the upper bandage, and twist it until the arterial flow stopped, thus giving time for the securing of permanent hemostasis. This was a most important discovery; indeed, it is doubtful if the ligature in amputation could have won out as the method of choice, had it not been for this maneuver. The introduction of the tourniquet was rapid. Dionis (1707) who credited the invention to Morel, recommended it and Heister (1724) described its application and illustrated the procedure in his great surgery both in the upper and lower extremities. In these plates, small rolls of cloth were indicated beneath the tourniquet over the femoral and brachial arteries, an evidence of the

application of the current anatomical and physiological knowledge. Further improvements of the tourniquet, such as Petit's screw tourniquet, the tourniquet of rubber tubing, the Esmarch bandage and the calliper tourniquet were unimportant compared with the establishment of the principle by Morel.

The reign of the *Roi Soleil* in France meant as much for surgery as for the other arts which he patronized. The cure by Felix of the royal fistula-in-ano served to place the French surgeon at a point of advantage as regards education so that in the succeeding generation there appeared the great French school of the early eighteenth century, marked by such names as Petit, Desault and Chopart. Of this school all modern surgery is the lineal descendant.

By surveying the work of these men together with that of Cheselden and Pott in England and Heister in Germany, one may arrive at the standard practice of the eighteenth century. It is at once apparent that the tourniquet had won the field. No longer was there discussion of the problem of the staying of blood during the operation itself, nor was there any question as to the desirability of amputating above the disease. The Paré method had not clearly won out, however, for the chemical styptics ranked first, though the actual cautery is a poor third. The application of the tourniquet was described with precision but the ligature was reserved for the large vessels in amputations above the knee or elbow which were now for the first time generally attempted. The "vitriol or hemostatic button" was employed for medium sized vessels, alum for the still smaller and direct compression

followed by bandaging for the smallest of all. The chemical styptic had displaced the actual cautery as well as

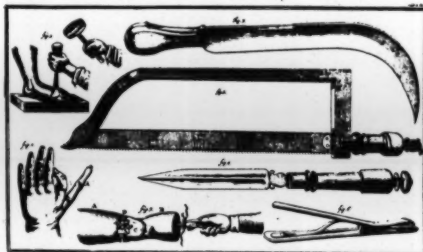


FIG. 13. "BEC DE CORBIN" NOW HOLDS ITSELF CLOSED WITH SPRING (FIG. 6). METHOD OF APPLICATION AND TOURNIQUET ARE SHOWN. (HEISTER, 1718.)

the animal or vegetable styptics of cobweb, hare's fur, dust, etc., that were so popular before the time of Paracelsus.

Heister (1724) said in discussing the control of hemorrhage after amputation, that the older surgeons and still a few in his day, used the actual cautery applied to the openings of the blood vessels but that this had been largely discarded, partly because of the fear of the patient having a secondary hemorrhage when the eschar over the vessel fell off. He considered the method still useful and safe for the smaller vessels, but many even here he ligated and with greater safety by drawing the vessel out with a "raven's beak" or artery forceps and tying with a strong waxed thread.

In Mr. Cheselden's edition of Le Dran's "The Operations in Surgery" the control of hemorrhage in amputation is discussed as follows:

The hemorrhage may be stopt by different methods, as First, by the application of a button of vitriol to the vessel; Secondly, by applying a button of alum; Thirdly, by a ligature; Each of which has its advantages and inconveniences. The button of vitriol supported by compres-

sion is a good way; the vitriol dissolving gradually, cauterizes the vessel and the flesh to a certain height, and the blood

have their inconvenience, yet we are obliged to make use of one of them; and herein we must be determined according

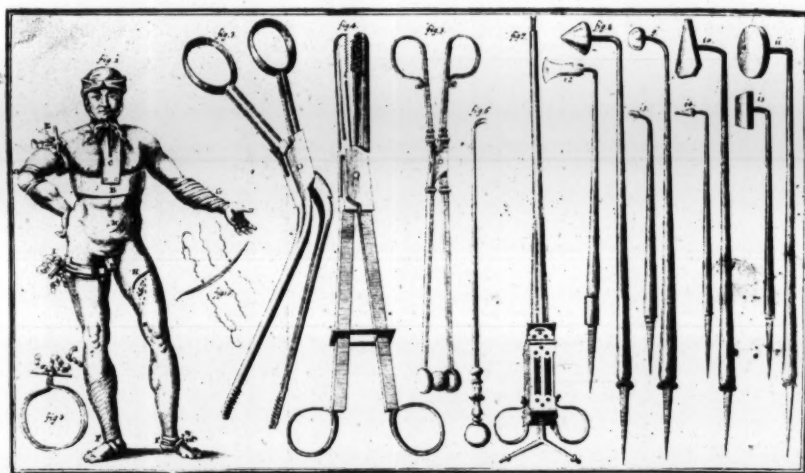


FIG. 14. TOURNIQUET SHOWN WITH COMPRESSION BOLSTERS OVER FEMORAL AND BRACHIAL ARTERIES. CAUTERIES STILL PRESENT HOWEVER. (HEISTER.)

coagulating in the vessel above the part cauterized, the eschar falls off by suppuration. This method, however, is not without inconveniences; for if the button of vitriol be too large, the eschar extends farther than we would have it, cauterizing a great deal of the flesh, and sometimes the surface of the bone. To prevent this accident, the button should be very small and well supported. The button of alum, supported likewise by compression, serves equally well to restrain the haemorrhage, by closing the mouth of the vessel, where a clot is formed, which stops the aperture in the artery; but as it produces no eschar, there is always room to fear that the clot, having nothing to keep it up, may come away, and consequently a haemorrhage ensue. Tying the vessel then is the most secure way; though that too is attended with an inconvenience, it being very difficult to avoid tying the nerve that accompanies the artery, which after a few days sometimes brings on convulsions that make it necessary to cut the ligature.

However, though each of these methods

as different circumstances appear to make either of them preferable. When a patient is properly accommodated, and can be kept quiet, the button may be applied, as we may thereby secure the haemorrhage without running the hazard of convulsions; but if the patient must be moved after the amputation, it will be proper to use the ligature as being the most secure means, and especially as the convulsions, if they do ensue, do not appear till some days after the operation.

In order to make the ligature, I take a crooked blunt-pointed needle armed with two or three threads waxed together, and pass it round the vessel, taking flesh enough with it to prevent the threads from cutting through. I then tie the two ends of the threads together with a double knot, and make a single once over that. If several vessels bleed together, they must be tied one after another unless they can all be included within the same ligature. This done, the tourniquet is to be loosened entirely, and the ends of the threads should be left long enough to be

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brought over the stump, that they may be distinguished from the lint which is to cover the wound.

This represents the best practice in the first half of the eighteenth century.

Sharp, a pupil of Cheselden's, in a "Critical Enquiry into the Present State of Surgery" (1750) criticized the current objections to the use of the ligature. He dwelt upon the danger of secondary hemorrhage from the cauterized vessel, believed this even greater in the case of the potential cautery, but in particular he devoted considerable space to the argument that the tying of a nerve would lead to convulsions, a matter stated as a fact by most writers of the time. This was an old doctrine, foisted upon the world by Galen, and persisting today in the vulgar conception that tetanus is the result of an injury to a nerve. He said that though surgeons laid most emphasis on the danger of tying the nerve, large vessels with the accompanying nerve had been ligated many times without producing convulsions and cited Valsalva as having described the dissection of such a double ligation at the elbow. Mass ligation of vessels was now given up partly because of the likelihood of including the adjacent nerves and partly because an attempt was now being made to obtain healing of the wound by something approximating first intention. For the latter purpose, it was advisable to have the ligature come away more quickly, which it did when applied to the vessel alone.

With the crude forceps of the day, designed for the extraction of foreign bodies and resembling the sequestrum forceps of the present time, it was difficult to draw out the artery alone. To meet this need the tenaculum of the ancient Romans was reintroduced

and toward the middle of the eighteenth century the policy of careful ligation of all vessels, thus caught up and carefully isolated, was in general use by such men as Desault, Cheselden and Pott.

Down to the end of this century the majority of men thought of the great vessels, as powerful agents of possible disaster which needed strong ligatures for their subjugation and the material, whether silk or flax was gross. Thus a large amount of material was left in the wound. Since the time of Harvey it had gradually become understood that the flow of the blood was outward through the artery and inward through the vein. From both clinical and experimental evidence, it was supposed that pressure in the artery was high and in the vein, low. An exact knowledge of the pressure in these vessels was provided by Stephen Hales in his "Hemodynamics" (1733), in which he described placing a long glass tube in the carotid of a horse and determining the length to which the column of blood rose. Up to this time, also, it was supposed that the arrest of hemorrhage in a divided vessel was in large part mechanical. Coagulation was recognized but thought of more as a result than as the cause of the stoppage of the flow. Petit, who is better known for his tourniquet, studied this topic in 1731 and concluded that the bleeding from a divided artery was stopped by the formation of a coagulum of blood which was situated partly within and partly without the vessel and which adhered to the inside of the artery, to the orifice and to the surrounding parts. After ligation a similar clot formed above the ligature and the same result might be caused by the temporary compression of a

vessel. He, for the first time, recognized that the essential factor in the control of hemorrhage was the coagulation of the blood. His conclusions were sharply questioned by those who believed that the constriction and retraction of the artery in a purely mechanical fashion closed the vessel and by others who thought that the swelling of the injured tissue was the important factor. This question was not decided conclusively until the experimental work of Jones, who, trained in the Hunterian school of experimentation, wrote a conclusive monograph on the subject. He was aided in part no doubt by the classical work of William Hewson published as an "Experimental Inquiry into the Properties of the Blood" (1771) in which was described the separation of a "coagulable lymph" from the blood itself. The more detailed anatomical research of the day made possible in part by the more general use of the microscope (Malpighi and van Leeuwenhoek) had demonstrated the three layers of the artery. Desault had previously described the rupture of the inner and middle coats of the artery on ligation. Jones by his experimental work confirmed this. He also clearly demonstrated that the coagulum formed as a result of the rupture of these coats was the essential factor in the staying of hemorrhage. One has but to read the discussion of these points in Cooper's dictionary to realize how the atmosphere was cleared by this experimental work.

Precisely what happened to the ligature was also determined. "Ulceration" in the language of the day occurred through the outer coat, which alone was held within its grasp, the inner and middle having fused with the coagulum and when this

ulceration had sufficiently progressed, the thread was released and came away. This process, we now know, was usually the result of sepsis, which did not as a rule invade the inner coats because of the barrier of the intact outer layer. It sometimes did, however, and then separation of the ligature was followed by a secondary hemorrhage, the "bête noir" of the period. It was noted that the greater the amount of suppuration the greater the chance of this happening and in general also, that the degree of suppuration was in direct proportion to the amount of foreign matter left in the wound. In order to lessen this the practice of removing both ends of the ligatures close to the knot was published by Hare in England in 1786. This was never seriously adopted, for the buried knots were invariably discharged from the wound a long time after the healing had been apparently completed. However, the practice revived by Vetch in 1806 of removing one of the threads while leaving the other hanging out of the wound was fairly generally used. In this way the danger of secondary hemorrhage was reduced to a minimum.

It must not be supposed that suppuration of the amputated stump or of the wound was the inevitable result of every operation. The English school in particular, following the lead of Cheselden, strove to obtain *per primam* healing. Cleanliness in every detail was emphasized and the immediate closure of the wound attempted, so that frequently, perhaps as a rule in certain hands, the wound healed with the exception of the tracts through which ran the trailing ligatures. If these could be done away with, then the whole wound might

heal in the desired manner. It is to the credit of American surgery that this was seriously attempted and along the line which later proved successful. Philip Syng Physick in 1806, recommended and used buckskin twisted in the form of a thread and with the ends cut short. The procedure was described in Dorsey's American edition of Cooper's surgery and undoubtedly achieved a considerable popularity in this country, inasmuch as Jameson of Baltimore was still advocating a modification of it in 1827. Nathan Smith employed a buckskin thong in tying the pedicle in his ovariectomy in 1821 and Ephraim McDowell is said to have employed a similar technique. In England Sir Astley Cooper tried out the procedure but it had apparently fallen into disuse by the time of Liston in 1838, although Malgaigne in France still advocated it. Liston in his "Practical Surgery" says:

The practice of cutting off both ends of the ligature was at one time very much in fashion. It was thought that the mere noose or knot might by possibility remain imbedded in the living tissues, surrounded by a cellular cyst, and occasion no annoyance; and again it was fondly imagined and hoped, that by employing ligatures of animal substance, tendon, cat-gut, or fish-skin, that the noose after answering its purpose of closing the vessel for a sufficient length of time, might be removed by the absorbents, and thus occasion neither irritation nor annoyance. It has never yet been explained, however, by the advocates for this practice, why the absorption of the ligature should take place exactly at the favourable period and not before. Nor has it been shown that it does so at any period, whatever the substance employed may have been. All these hopes have been disappointed; ligatures, of whatever substance, do now

and then remain hid for a long time, but very generally they occasion trouble; they, perhaps, after the cure has been thought complete, give rise to irritation, pain, inflammatory swelling and formation of matter; abscess after abscess ensues, one knot comes out after another, and ultimately all the offending foreign bodies may be expelled, but the perfect recovery is thus very long protracted.

In the first half of the nineteenth century with the advance of knowledge concerning the anatomy and physiology of the blood vessels and its application, surgeons ventured upon elective operations, gradually extending these to a point where the penalty of sepsis became too great a hazard. The experimental demonstration by John Hunter of the development of a collateral circulation following the ligation of a vessel led to the elective ligation in continuity. The immediate application was to aneurysms of the peripheral vessels. With the skill acquired from this experience surgeons became more daring as told in Halsted's "Operative Story of Goitre." For instance, occasional masters attempted extirpation of the thyroid, the most vascular of all operative procedures. Von Graefe in Berlin, 1822, removed a thyroid with the ligation of 53 arteries, Roux in 1835 with 47 ligations; Pirogof in 1849 with a ligation of 30 arteries. General opinion was against this operation, however, and it remained for von Bruns, Kocher and Halsted to perfect the details of the procedure sufficiently to make it reasonably safe. A more profound and accurate knowledge of the blood supply of the gland was needed and some more facile instrument for temporarily arresting hemorrhage than the tenaculum or the ligature carrier.

The invention of the progenitor of the artery forceps, the dental forceps, probably antedates written history. Krombholz says that Erasistratus described a leaden forceps hanging in the temple of the oracle at Delphi. Hippocrates speaks of such an instrument as a necessity for the extraction of teeth and they have been found many times in the armamentarium of the Roman surgeon. Such instruments were undoubtedly early adopted for the extraction of foreign bodies such as arrowheads and later, missiles thrown by exploding gunpowder. In Albucasis several varieties were depicted and were copied freely down to the time of Paré and Scultetus. The former gives the first description of the application of the forceps to blood vessels when he recommends the use of a "bec de corbin" for drawing out the artery to be ligated. This instrument, modeled on one depicted in Albucasis, was very similar to those found at Pompeii and was used ordinarily for the extraction of foreign bodies as is illustrated elsewhere in Paré's work. In the "*Armamentarium Chirurgicum*" (1653) of Scultetus, this instrument as well as several others of a similar nature are shown. Down to the time of Desault the vessel was caught necessarily together with surrounding tissue with similar crude and cumbersome instruments or directly in the fingers of the operator or an assistant.

With the development of the practice of carefully isolating the vessels as initiated by Desault in France, and in England by Cheselden, it became important to employ some finer instrument and the tenaculum was resorted to. The antecedents of this likewise fade into the past. We only know that Celsus recommended it for lifting

vessels in a wound, so that they might be ligated and Heliodorus for catching them up in the operation for hernia in order to submit them to torsion. It, like the foreign body forceps, has been repeatedly found in the Roman surgical chest. In its rejuvenation as a well fashioned, graceful instrument of precision, it was to appear, next to the knife, as the chief instrument on the surgeon's table until nearly the end of the nineteenth century and in the dexterous hands of such a man as Liston it undoubtedly was most efficient. It was soon modified to become a ligature carrier, the "*tertium necessitatum*" for the control of hemorrhage during this period.

With the extension of fine dissecting in human and comparative anatomy and the manipulation of microscopical objects, there developed the dissecting forceps, such as is still used. This with a contrivance for holding it closed as suggested by Von Graefe, the elder, became the first instrument properly called the artery forceps. Amussat of Paris, at about the same time (1829) devised a similar device for torsion of the vessels while Bushe of New York checked bleeding "by twisting the cut extremities of the vessels in a square beaked forceps, furnished with a sliding bar and two nuts."

Mr. Liston in 1838 said:

If the cellular substance is loose and fine, no difficulty will be experienced in pulling out the open end of the vessel, by the use of the common dissection forceps, or sharp hook tenaculum as it is commonly called. When no assistance is at hand, the surgeon will find the advantage of possessing a pair of forceps with well fitted joints and which are held closely in contact by a catch or slide; these are now

to be had of the various instrument makers, of a much less clumsy form than heretofore.

invented in 1800, while below it is shown the bullet forceps from which it was very apparently an

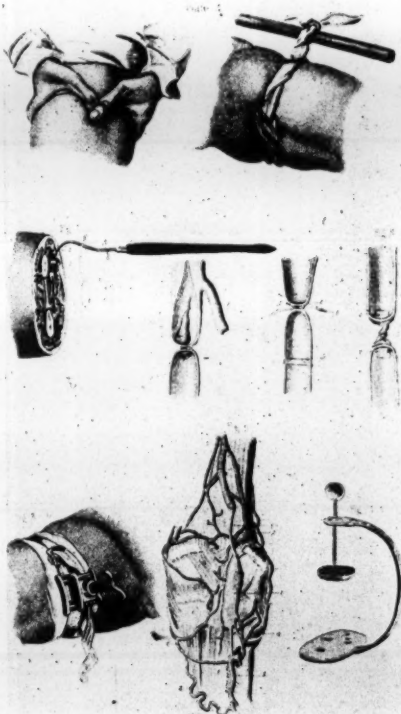


FIG. 15. PRACTICE OF TOURNIQUET AND TENACULUM AS DEPICTED IN SMITH (1850).

For amputation through the thigh his instrumentarium consisted of: "a long, narrow, blunt-backed and sharp-pointed knife, a plain, good, and serviceable saw, a pair of dissecting forceps and a pair or two with a catch." No tenaculum was included, apparently because he had come to rely upon the forceps which were to bear his name in English literature down to the present time. In Smith's "System of Surgery" (1851), an excellent steel engraving shows such forceps and also the progenitor of our modern hemostat, Philip Syng Physick's artery clamp and needle holder

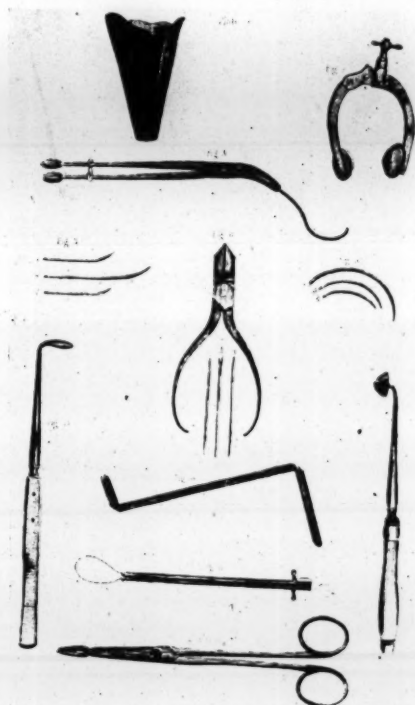


FIG. 16. FIGURE 3 SHOWS PHILIP SYNG PHYSICK'S NEEDLE HOLDER AND FIGURE 12 A FORCEPS WHICH WITH CATCH WOULD BE PRACTICALLY MODERN. CAUTERY HAS ALMOST GONE. (SMITH, 1850.)

offspring of the first generation. It only needed the addition of a ratchet instead of a hook-catch to make it quite modern.

Probably with knowledge of this, Charriere in 1858 introduced a similar forceps with a catch and ring handle for dressings and for the torsion of vessels. In 1862, Koeberlé used these for clamping a vessel, leaving them in place for several days, the principle being somewhat similar to Sir James Simpson's acupressure of the same period. Péan in 1867 and Spencer Wells in 1872 popularized this forc-

pressure and each devised hemostatic clamps which still survive under their respective names. At the same time, these clamps and a similar one, described by Bryant, were used largely for the torsion of vessels without tying and with surprising success, even arteries the size of the femoral being so controlled.

Halsted gives a description of von Brun's methods as reported by Suskind in 1877:

The tissues to be divided were canalized layerwise with Cooper's scissors, the fingers or the handle of a knife. Along the passage thus made, a ligature-needle would be passed, and the tissues, including vessels, would be divided between the two ligatures.

I was pleased to find in Suskind's description a list of instruments employed by Bruns in his operations for goitre: "Several pointed bistouries, several forceps (preferably toothed forceps), Cooper's scissors, one aneurism-needle (preferably the blunt, ligation-needle of Bruns), a Muzeux's hooked forceps (Vulsella) or a fenestrated forceps, ligature-rods of Graefe or Dupuytren, catgut and silk, sponges, water, blunt hooks." No mention is made of artery forceps; this may be an oversight, for Bruns in his *Handbuch der Chirurgischen Praxis*, vol. i, p. 29 (1873) says: "The ordinary forceps which are closed by finger pressure can be held permanently closed by various devices, among which the Schiebervorrichtung of Fricke has proved to be best suited to the purpose. Most frequently such lockable forceps are employed for the tying of bleeding arteries and hence have been named artery forceps, although they are often used to grasp the cut edges of the skin or mucous membrane, or bits of sponge with which blood and mucous are wiped away."

Halsted remarks of Billroth's clinic at the same period:

Clamps had come into use and Billroth was evidently learning some of the various purposes which they were to serve; for example, he divided tissues containing vessels between two of them and would leave a number hanging in the wound.

The development of the modern hemostat is best given in Halsted's own words:

On my return from Germany in 1881, I was impressed with the fact that our surgeons were greatly handicapped in most of their operations by lack of proper instruments, particularly of artery clamps. These were insufficient in number and faulty in design. In most of the New York Hospitals the only artery clamps were of the fenestrated, mouse-toothed, spring forceps variety (Liston's and Wakley's), indeed, these were about the only ones procurable either in this country or England. In the elaborate catalogue for 1882 of S. Maw, Son and Thompson, London, no other artery forceps, torsion forceps excepted, is mentioned.

In a catalogue of Collins et Cie, Paris, undated, but evidently of about the same period, the little artery clamps of Koeberle and of Pean are the only ones figured; "pincers à artères à ressorts" are catalogued, the latter probably being the mouse-toothed forceps given in the London catalogue (Maw and Son) and quite universally employed in America until 1880 or a little later. In Gunther's *Surgery* (vol. i, Plate 5, opp. p. 36) is a remarkable lithograph which indicates the part played by the tenaculum in hemostasis in 1859. The divided artery, open-mouthed, is hooked up on the point of the instrument, the handle of which is held in the mouth of the operator who, evidently, was shorthanded. Until about 1890, the tenaculum was a favorite instrument in America for checking hemorrhage, especially with some of the senior surgeons, and until about 1880 was quite universally employed here, its only rivals being

the inadequate mouse-toothed, spring forceps and the Pean or Koeberle clamps. Then almost simultaneously came the clamps of Spencer Wells and (1879) of the writer, of which the Pean-Koeberle clamp was the prototype. The point of my clamp was snub-nosed originally, but the length and spread of the handles, the essentially new features, were the same as at present. With the development of the transfixion method with milliner's needles and use of the fine black silk, the nose of the clamp was made finer (1889). Two or three years later it assumed its present form. Rarely had I seen in our country, prior to my first visit to Europe (1879), more than one artery clamp at a time left hanging in a wound. Clamps were too few for this—four to three or even two being considered ample for an operation. Few hospitals, in New York at least, possessed as many as six artery clamps in 1880. I recall vividly an operation in Vienna performed by Mikulicz in 1879 in Billroth's clinic. Americans, newly arrived in Austria, we were greatly amused at seeing perhaps a dozen clamps (Schieber) left hanging in a wound of the neck while the operator proceeded with his dissection, and were inclined to ridicule the method as being untidy or uncouth. Slowly it dawned upon us that we in America were novices in the art as well as the science of surgery. The artery forceps, adequate in number and design, undoubtedly played a very important rôle in the strikingly rapid progress in the art of operating made by surgeons, the world over, in the final quarter of the past century. The value of the artery clamps is not likely to be overestimated. They determine methods and effect results impossible without them. They tranquilize the operator. In a wound that is perfectly dry, and in tissues never permitted to become even stained by blood, the operator, unperturbed, may work for hours without fatigue. The confidence gradually acquired from masterfulness in controlling hemorrhage gives to the surgeon the calm which is so essential for clear think-

ing and orderly procedure at the operating table.

The development of the artery forceps was occasioned by the great increase in the volume of surgery which was the result of the introduction of anesthesia in 1846 and of the Listerian principles of 1865 to 1870. The latter also had a profound influence on the mode of use and the material of the ligature in which Lister's contribution was only second to that of the introduction of his antiseptic method.

With previous attempts to obtain early and complete healing of the wound by the cutting off of the ends of the ligatures, the knots came away in repeated sinuses and delayed the time of healing. This was true even with the animal ligatures proposed by Physick, yet they had not completely gone out of practice for Malgaigne in 1852 still said:

We prefer the ligature of doe-skin, not soft, as Jamieson likes them, but rolled up, as used by Physick and Dorsey. They divide the inner coat like vegetable thread but are easily absorbed, so that we may remove the two extremities very near the knot; if on the contrary common thread is used, only one end is cut, and the other hangs from the wound.

In 1867 Lister in his second paper on "The Antiseptic Principle" indicated that he was already experimenting with the ligature:

On the 12th of December last, I tied the left carotid of a horse about the middle of the neck, using fine but strong "purse-silk," unwaxed, but steeped for some time in a saturated watery solution of carbolic acid. The ligature having been tightly tied, so as to rupture the internal and middle coats, its ends were cut short, and the wound was freely treated with car-

bolic acid dissolved in forty parts of water.

Demonstrating the specimen later removed, he noted that the thread had been bridged over externally by dense fibrous tissues. He felt that this demonstrated: "that the antiseptic system would free the deligation of a large artery in its continuity of the two essential elements of danger to which it is now liable, viz., an unhealthy condition of the wound and secondary haemorrhage."

He at once carried the conclusions arrived at from this experiment into practice and in January of that year ligated the external iliac for an aneurysm of the femoral artery, using twisted silk which had been soaked in carbolic acid, the operation being conducted throughout according to the antiseptic method. Unfortunately, he had not yet learned that the wound should be closed completely and he introduced a "pledget of lint" deeply into it, projecting externally to act as a drain. At the end of a fortnight the last of the lint was removed and in four weeks the wound was completely cicatrized. Ten months later the patient died from the rupture of a thoracic aneurysm and Lister was enabled to examine the results of the operation. He found that:

At the narrowest part the artery was reduced to mere fibrous tissue, constituting a dense white band five-eighths of an inch long, from the middle of which was seen projecting at one side a round, buff-coloured appendage about a line in diameter, somewhat obscured by a trifling amount of inflammatory condensation of texture in the immediate vicinity. On scratching this little body with the point of a knife, I found it to be a very thin-walled capsule, containing the knot of the ligature, with two tapering ends, which

were shorter than the thread was cut at the operation, while the noose had vanished altogether. The surface of the knot also showed clear indications of having been subjected to an eroding agency, similar, no doubt, to that exerted by granulations upon dead bone absorbed by them. Besides the remnant of the ligature, the tiny capsule contained a minute quantity of yellowish, semifluid material, looking to the naked eye like very thick pus. There can be no doubt that the presence of the thread was in some way or other the cause of this and I think we can hardly be wrong in assuming that, in order to give rise to such degeneration of tissue, it must have operated as a persistent, if trifling, source of abnormal stimulation. Now, as putrefaction is here out of the question, and as the substance of silk is not chemically stimulating, we seem shut up to the conclusion that the thread must have occasioned disturbance of a mechanical nature.

Not having at hand cultural methods to be developed shortly by Pasteur and Koch, no attempt was made to grow organisms from this pus and Lister assumed that silk as a material must be discarded because it produced mechanical irritation. We now know that his conclusions were wrong and that he was dealing with an infected ligature probably via the lint drain. This led him to turn to the "animal" or absorbable ligature as a solution of the problem. He discussed this as follows:

The use of "animal ligatures," of catgut, leather, or tendon, was long since tried and abandoned as unsatisfactory; but after the experience which the antiseptic system has afforded of the disappearance, without suppuration, of large dead pieces of skin and other textures, there could be little doubt that threads of animal tissue, if applied antiseptically, would be similarly disposed of.

On the 31st of December, 1868, I tied the right carotid artery about the middle of the neck in a healthy calf a few days old, the animal being under chloroform. Ligatures of two different kinds were employed, at an interval of about an inch and a half, the sheath of the vessel being left undisturbed in the intervening part. The cardiac ligature was of home manufacture, composed of three strips of peritoneum from the small intestine of an ox, firmly twisted together into a three-fold cord. The distal thread was of fine catgut, called "minikin gut" by the London makers. Both had been soaked for four hours in a saturated watery solution of carbolic acid, which swelled and softened them, so that the thread of my own making was too large to enter the eye of the aneurysm-needle except near the ends, where it was thinner than elsewhere. This substantial ligature, bore the strain of tying well, but the fine catgut broke as I tightened the noose. I did not, however, remove it, but having a second piece at my disposal, passed it round at the same place, and with gentle traction completed the knot. There were thus two ligatures of the fine gut at the distal site. All were cut short except one end of the catgut, which I purposely left about three-quarters of an inch long, to give a better opportunity of ascertaining what would become of the foreign method.

He then described how living tissue grew into the crust in a wound and continued:

Hence it might have been anticipated that the ligatures of peritoneum and catgut placed on the calf's carotid would, after the expiration of a month, be found transformed into bands of living tissue. Such was, in truth, the case, as was apparent on closer examination. They had, indeed, a deceptive resemblance to their former condition, from the persistence in their substance of the impurities of the original materials, the dark adventitious particles being of mineral nature

incapable of absorption, so that they had remained as a sort of tattooing of the new structure. Nevertheless, a marked alteration in colour had taken place, especially in the distal ligature, where the dirty grey of the softened catgut had changed to a dirty pink tint. The two pieces of catgut which had been tied around the vessel at that part had become, as it were, fused together into a single fleshy band, inseparably blended with the external coat of the artery. The knots were nowhere discoverable, and the only indication of the end which had been left long at the time of the operation was the presence of a black speck here and there upon a delicate thread of cellular tissue in connexion with the vessel.

He described the microscopical reaction and called attention to the fibroplastic reaction of tissues which invaded the ligature. In conclusion, he said:

It appears, then, that by applying a ligature of animal tissue antiseptically upon an artery, whether tightly or gently, we virtually surround it with a ring of living tissue, and strengthen the vessel where we obstruct it. The surgeon, therefore, may now tie an arterial trunk in its continuity close to a large branch, secure alike against secondary haemorrhage and deep-seated suppuration—provided always that he has so studied the principles of the antiseptic system, and so carefully considered the details of the mode of dressing best adapted to the particular case in hand, that he can feel certain of avoiding putrefaction in the wound. For my own part, I should now, without hesitation, undertake ligature of the innominate, believing that it would prove a very safe procedure.

He spoke of the availability of catgut:

... catgut, manufactured from the small intestine of the sheep, may be had at a low price, from the thickness of a

horsehair upwards. As sold in the shops, however, it is quite unfit for the purpose of the surgeon. For, when moistened with water or with the animal fluids, it becomes not only very soft and weak, but as slippery as a piece of recent intestine, so that a knot tied upon it yields to the slightest traction.

He at once entered upon experimentation as to the manufacture of catgut, first producing a carbolized gut and in 1876 describing its chroma-tization, the last essential step in the production of the present-day absorbable ligature.

The choice of catgut was in a sense fortuitous. It was and still remains the only absorbable animal tissue in the form of a thread which is a matter of common commerce. Its origin, like that of silk, linen and woolen thread, is lost in antiquity. It was used for the bowstring of the North American Indian and for the primitive stringed musical instruments of the native inhabitants of India. Odysseus, stretched the twisted intestine of the sheep upon the bow which gave forth grim music for the suitors of Penelope and the strings of the Egyptian and Greek lyre were of catgut. Indeed, Wilkinson found an instrument so strung in the tomb of Rameses and was able to elicit after some 3000 years a note from the same cord which may have charmed the ear of the great Pharaoh himself. Catgut was to be obtained in Rome, for Galen suggested its use as a substitute for

linen and Rhazes used it in the suture of the intestine, perhaps on the principle of *similias similibus curantur*. With the development of the bowed string instrument, the progenitor of the violin, catgut became an important article of commerce in Italy and France. Its sporadic use as a ligature up until the time of Lister must have led, in many instances, to infection of the most disastrous kind, such as anthrax and tetanus, but the discovery of antiseptis and asepsis rendered its use safe. It was rapidly adopted throughout the world.

The art of hemostasis, equalling in importance the control of infection and the introduction of anesthesia, has been slowly but finally learned. The manipulation of the present day—the application of an artery forceps and the casting about the vessel of a ligature—is so simple a process that we little realize the travail that has gone into its perfection. The groping Alexandrian anatomist, the practical Greco-Roman surgeon, the consummate Paré, the obscure Morel, and the patient experimentalist, Lister, contributed the essentials, a host of surgeons provided the refinements. As a result, the operator of today may relegate to the background of the procedure that which for ages was an almost insurmountable obstacle and proceed without fear of hemorrhage calmly and unhurriedly, in such a manner as to ensure for the patient all that surgical skill can provide.

WILLIAM BEAUMONT AND HIS BOOK ELISHA NORTH AND HIS COPY OF BEAUMONT'S BOOK*

By WILLIAM SNOW MILLER, M.D., SC.D.

MADISON, WISCONSIN

IN 1833, Dr. William Beaumont published at Plattsburgh, New York, a book bearing the title "Experiments and Observations on the Gastric Juice, and the Physiology of Digestion." This was not a "pot boiler" as are many of the modern books. It was a scientific treatise, based on observations which no other person had recorded. It is one of the outstanding contributions made by The United States of America to scientific medicine.¹

HISTORY OF MY COPY OF BEAUMONT

The history of my copy of Beaumont is interesting. It belonged originally to Elisha North, a distinguished physician, who spent the greater part of his professional life at New London, Connecticut. He paid \$2.00 for it, as he recorded on the inside of the front cover.²

Shortly after graduating from the Medical Department of Yale in 1879, I began the practice of medicine in South Britain, Connecticut, a well-to-do farming community. The only physician in the place, Dr. Nathan C. Baldwin, was retiring from practice on account of age and ill-health. He belonged to that class of physicians, now practically extinct, known as the "old family physician." He was unusually well informed and had an extensive library. Very generously he took me with him on his rounds the day after I reached the place, intro-

duced me to his patients, told them that it was his last visit and that he was turning over to me all of his patients.

Some days after this he called me into his office and offered to give me his library. Alas! I did not at that time possess any knowledge of medical history nor did I recognize the value of his books. The old Doctor took down several volumes and insisted that I take them, "for," he said, "they are unusual books;" one of these was the volume under consideration.

In 1886, unable to endure the strenuousness of a country practice, and recognizing an increasing difficulty in hearing, I gave up the practice of medicine and resolved to devote my time to research. After wandering from one institution to another in this country and spending some time in Germany, I settled at the University of Wisconsin.

Eventually I became interested in the history of medicine and I wrote to the widow of the old Doctor and asked her what information she could give me in regard to Elisha North, and how her husband happened to have so many books which formerly belonged to him? From her reply I abstract the following:

I have delayed replying to your letter hoping to be able to gather some facts relating to Dr. Elisha North. Unfortunately I have not been successful. I never met him, nor have I heard much about

* Read before the Medical History Seminar, University of Wisconsin, 1926; also by invitation before a conjoint meeting of the Institute of Medicine and the Society of Medical History of Chicago, Jan. 25, 1929.

him. My husband's first wife was a distant relative and the families exchanged frequent visits.

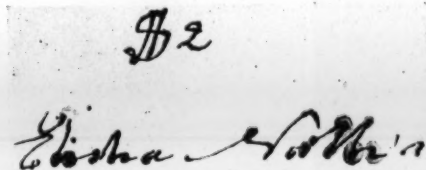


FIG. 1. ELISHA NORTH'S SIGNATURE AS IT APPEARS IN HIS COPY OF BEAUMONT.

My husband, Dr. Baldwin, was born in New York City, February 16, 1814. His childhood was spent there, excepting occasional visits in the summer to his Grandfather in Woodbridge, Connecticut. His parents died when he was fourteen or fifteen years old. He prepared for college at a school in Derby, Connecticut; quite a noted school at that time. He did not immediately enter the Yale Medical School, but took a position for a while as book keeper in the Chemical factory in New York, formerly owned, and also established by his father, Hezekiah Harvey Baldwin.³

While there he had a very severe illness from which he was not expected to recover. His physicians said in case he survived his nerves would be ruined for life; this proved to be a sad fact. After regaining some measure of health he entered the Yale Medical School. On graduating from it (1837) he opened an office on Chapel St., New Haven, where he remained till he was invited to remove to South Britain in the summer of 1840, and where he practiced medicine till your arrival in 1881. He passed away December 24, 1885.

Such is the history of the book up to the time it came into my possession. I have seen six copies of the first edition of Beaumont, and all of them have belonged to Connecticut country physicians. This speaks well for the interest the "old family physician" took in Beaumont and his work.

THE BOOK

While the work of Beaumont was the first exhaustive treatise on the physiology of digestion, there had appeared earlier in the century three notable theses on the subject from the Medical Department of the University of Pennsylvania. The first of these by Dr. John R. Young, was published in 1803 and bore the title "An Experimental Inquiry into the Principles of Nutrition and the Digestive Process." The second was by Dr. Oliver H. Spencer, with the title "Experiments and Observations on Digestion;" also published in 1803. The third was by Dr. Thomas Ewell whose thesis, written in 1804, was published in 1805, with the title "Notes on the Stomach and Secretion." The first of these theses has been described in detail by Dr. Howard A. Kelly, and I have called attention to the work of Ewell.⁴

In his introductory chapter, Beaumont describes the accident to Alexis St. Martin which, after his recovery, left him with a gastric fistula. Myer,⁵ in his "Life and Letters of Dr. William Beaumont," collected a number of cases which had been described previous to the time of Beaumont; but Beaumont was the first to take advantage of the opportunity, thus presented, to learn more about the process of digestion. He describes his observations under the following heads:

1. Of Aliment.
2. Of Hunger and Thirst.
3. Of Satisfaction and Satiety.
4. Of Mastication, Insalivation and Deglutition.
5. Of Digestion by the Gastric Juice.
6. Of the Appearance of the Villous Coat, and of the Motions of the Stomach.
7. Of Chylification, and Uses of the Bile and Pancreatic Juice.

If we recall that Prout⁶ had announced, in 1824, that the acidity of the gastric juice was due to the presence of hydrochloric acid, and not to phosphoric acid or lactic acid as many thought; that Hoppe-Seyler,⁷ who introduced the word "proteid" into physiology was a boy only eight years old, and that the word "enzyme"⁸ had not been coined, it is of interest to see what Beaumont had to say on these various topics.

For the following résumé of Beaumont's work I must acknowledge my indebtedness to Prof. W. J. Meek, of the Department of Physiology at the University of Wisconsin. He has, very generously, permitted me to make use of the notes he presented on the work of Beaumont at the time I read this paper, and has been of material assistance in calling my attention to the work of more recent physiologists which has confirmed the earlier observations of Beaumont.

1. OF ALIMENT. Minuteness of division and tenderness of fiber are the two grand essentials for speedy and easy digestion.

"The digestion of animal and vegetable diet requires the same process. Generally speaking, vegetable aliment requires more time and probably greater powers of the gastric organs, than animal." Pawlow⁹ in his *Physiology of Digestion* amply substantiated these statements. More of the ferment pepsin was shown to be put out for bread than for meat.

"The ultimate principles of nutriment are probably always the same whether obtained from animal or vegetable diet." Beaumont's argument here was based not only on the similar appearance of chyme when subjected either to gastric, hepatic, or pancreatic fluids, but on the shrewder

observation that digestion was not merely "division and depuration" as often taught, since blood underwent the same digestive process as any other substance. It was not until the time of Emil Fischer¹⁰ and his analysis of proteins into their amino acids, that the views of Beaumont received their demonstration.

Beaumont presented extensive tables giving the length of time various foods required to become digested in the stomach. These data still remain valuable and a great contribution to practical dietetics.

Beaumont noted that oily substances are digested with great difficulty and that they delayed the passage of venison and steak (proteins) for some time. "Crude" vegetables, by some law of the animal economy, not well understood, are allowed, even when the stomach is in a healthy state, sometimes to pass the pyloric orifice, while other food is retained there to receive the solvent action of the gastric juice."

Condiments, particularly those of a spicy kind, alcohol and other stimulants such as tea and coffee were all condemned as producing an indirect debility of the stomach.

2. OF HUNGER AND THIRST. Beaumont recognized the true hunger pain. It is surprising that he missed the contractions associated with it. He rejects the idea that hunger is due to the rubbing together of the walls of the empty stomach, else we would feel hungry immediately after vomiting or in fevers. He does not believe it is the presence of a quantity of gastric juice in the otherwise empty organ, for if there were juice there which he unfortunately doubted, it is non-irritant to the stomach. Beaumont was a modern mechanistic phy-

siologist and Magendie's fine phrase that "hunger is produced like all other internal secretions, by the action of the nervous system, and it has no other seat than in this system itself," brought to his mind no satisfactory understanding.¹¹ Beaumont finally decided that the sense of hunger was produced by a distention of the gastric vessels, or that apparatus which secretes the gastric juice. This he saw full and distended in the stomach. Inflammation, a distention of the blood vessels produces pain, but not the hunger pain from distended gastric vessels. His logic at least was not bad.

3. SATISFACTION AND SATIETY. This is a plea for the former. Beaumont believed in abstemious habits. He believed that there was conveyed from the stomach to the encephalic center perfect intelligence regarding the proper quantity of food. Satisfaction was when the stomach says *enough*; satiety when the stomach says *too much*. "To effect this most agreeable of all sensations and conditions—the real Elysian satisfaction of the *reasonable Epicure*—timely attention must be paid to the preliminary processes, such as thorough mastication and moderate or slow deglutition." Beaumont's conclusions again are extremely good. He did not know of reflex and psychic secretion of gastric juice through the vagus nerve, but he knew, nevertheless, some very correct dietetic habits.

4. OF MASTICATION, INSALIVATION AND DEGLUTITION. Beaumont correctly gauged these processes as non-essentials to chymification, and says that "if the *materia alimentaria* could be introduced into the stomach in a finely divided state the operations of mastication, insalivation and deglu-

tition would not be necessary." He disagreed entirely with Jackson,¹² who had recently written that the saliva was the principal solvent of alimentary matter, for in his artificial digestions saliva seemed of no importance. True information in this field had here to wait for chemical advances. It was not until 1848 that Fehling introduced his test and made it possible to study carbohydrate digestion.¹³

Mastication and insalivation were, however, mechanically of great importance according to Beaumont. Food not well chewed and introduced into the stomach in too large particles had other changes taking place in it besides digestive ones. Here was a hint at true fermentation. If the food is retained in the stomach over five to ten hours or if it is permitted to pass into the intestines without proper chymification, very distressing symptoms of colic, flatulence, etc., result.

It is interesting to note that Beaumont missed the storage action of the fundus, although it is hard to believe that Alexis' stomach did not show it. On the contrary Beaumont believed that the stomach was not designed to receive any more food than it could mix with the juice already present. This idea came from the pathology of Alexis' orifice for, on introducing solids through it, that portion of the stomach contracted and allowed no more to be introduced for some 50-80 seconds.

5. OF DIGESTION BY THE GASTRIC JUICE. One of the remarkable things about Beaumont was his familiarity with the scientific literature of the day. He quotes Spallanzani, Tiedemann and Gmelin, Leuret, Lassaigne, Paris, Jackson, Broussais, Richerand, and many others. Spallanzani had

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practically overthrown the old idea that gastric action was one of putrefaction, trituration, fermentation and maceration.¹⁴ The experiments on Alexis, however, put these unfounded hypotheses to rest forever in favor of the true theory of chemical solutions. Since juice taken from the stomach as long as a year previous remained pure and exerted its digestive action undiminished, Beaumont concluded that the main action of the gastric juice was that of a solvent. It was only the general ignorance concerning the chemistry of carbohydrates and fats that led him to go too far and say that it was the *only* solvent.

Beaumont recognized the acidity of normal gastric juice and submitted samples to Professor Dunglison at the University of Virginia and to Professor Silliman at Yale. Both of these investigators reported the presence of free hydrochloric acid. This was important in confirming the work of Prout, and settling the controversy as to whether the acid was acetic, phosphoric or lactic. Beaumont's description of the pure gastric juice was noteworthy:

It is a clear, transparent fluid; inodorous, a little saltish; and very perceptibly acid. It is readily diffusible in water, wine, or spirits; slightly effervesces with alkalis; and is an effectual solvent of the *materia alimentaria*. It possesses the property of coagulating albumen in an eminent degree; it is powerfully antiseptic, checking the putrefaction of meat; and effectually restorative of healthy action, when applied to old, foetid sores, and foul ulcerating surfaces.

Beaumont thought that no juice was secreted until food entered the stomach. He thus missed both the psychic secretion of Pawlow and the constant, continuous secretion demon-

strated by Carlson.¹⁵ He did note, however, the effect of fear and anger in checking the secretion. The immediate stimulus to secretion according to Beaumont was the mechanical irritation of the gastric papillae by the food itself. He secured a flow by stimulating the inside of Alexis' stomach with a thermometer bulb or a rubber tube. It is probable that this was really an example of a psychic secretion.

6. OF THE APPEARANCE OF THE VILLOUS COAT AND OF THE MOTIONS OF THE STOMACH. Beaumont describes the appearance of the mucous lining of the stomach both at rest and in action. He never found any juice in the fasting stomach. The presence of bile in the stomach was often noted, reminding one of Boldyreff's observations.¹⁶

In regard to the movements of the stomach, Beaumont believed that the circular and longitudinal muscular coats contracted together producing a churning of the gastric contents, a phrase which remained in physiology for many a day. The layering described by Wilson Philip¹⁷ and later verified by the roentgen ray, he denied. In emptying the stomach he believed that the transverse band of muscle prevented any regurgitation into the fundus and allowed the pyloric portion of the stomach, as a whole, to exert pressure on its contents and force them through the pylorus. Solids excited the pylorus to closure and thus only liquids passed through.

7. OF CHYLIFICATION AND USES OF THE BILE AND PANCREATIC JUICE. The effect of bile and pancreatic juice on the chyme was quite mysterious to Beaumont, but he recognized that it consisted of a series of chemical changes.

WILLIAM BEAUMONT

It is not necessary to give an extended sketch of Beaumont's life, for this has already been done by Myer,⁵ and the following brief outline is taken, in the main, from his sketch.

William Beaumont was born at Lebanon, Connecticut, November 21, 1785. He was the third child, and the second son, of Samuel and Lucretia (Abel) Beaumont. Of his boyhood practically nothing is known. In the winter of 1806-1807, when twenty-one years of age, he left home and journeyed north. In the spring of 1807 he arrived at the village of Champlain, New York. Here he not only taught the village school and tended store, but he also began the study of medicine, reading books borrowed from Dr. Pomeroy of Burlington, Vermont.

James H. Lockwood, in his "Early Times and Events in Wisconsin" says: "In the summer of 1808, I boarded at Champlain Village, and attended the school taught by the late Dr. William Beaumont, who was then a student of medicine. Under his tuition I greatly improved myself in grammar, geography, &c., but at that early day I never saw a school atlas."¹⁸

In the fall of 1810, Beaumont went to St. Albans, Vermont, and apprenticed himself to Dr. Benjamin Chandler. During his apprenticeship he kept a note book which contained "some of his first lessons in prescription writing" and notes on "the important diseases with which he came in contact." Myer gives interesting abstracts from this note book which show his care in making and recording his observations.

Having completed his apprenticeship, Beaumont was licensed to prac-

tice medicine by the "Third Medical Society of the State of Vermont, as established by law." Myer reproduces the original of this license, which was granted "the 2d Tuesday of June, A.D. 1812." Beaumont remained with Dr. Chandler until September 8, 1812. On his departure, Dr. Chandler gave Beaumont a certificate in which he is described as a "safe and Judicious Practitioner."

War with England had been declared on June 18, 1812, and Beaumont saw an opportunity to display his patriotism and put into practice his knowledge of medicine and surgery. Accordingly he crossed Lake Champlain to Plattsburgh, New York, and presented his credentials to the proper authorities. These were promptly accepted, and on September 13, 1812, he began his duties as surgeon's mate. On December 2, 1812, President Madison issued his commission. January 1, 1813, due to the inactivity of the division of the army with which he was connected, he began private practice in Plattsburgh, but returned to active work in the army February 15, 1813. He was present at the battle of Little York¹⁹ and attended many of the soldiers who were injured by the treacherous blowing-up of the magazine by the British, when they evacuated the fort. He was also present at the battle of Plattsburgh. The treaty of Ghent was concluded in December, 1814, and ratified in February, 1815, thus bringing the war to a successful termination.

When the army was reduced by President Madison in March, 1815, Beaumont was one of the medical officers to be retained, while others "higher in rank and older in service were dropped." This was a high

testimonial to the efficiency of his work in the army. Nevertheless, Beaumont resigned from the army late

and was commissioned post surgeon by President Monroe on March 18, 1820, his rank to take date from



FIG. 2. WILLIAM BEAUMONT ABOUT THE TIME OF HIS MARRIAGE.

in 1815; and from that time until December, 1819, he engaged in private practice in Plattsburgh, combining with this a general grocery store in which choice brands of wine, New England rum, codfish, Spanish segars and drugs formed a part of the stock. During this time he had as a partner Dr. Senter, another army surgeon, and later, a man by the name of Wheelock.

In 1818, Dr. Joseph Lovell was appointed Surgeon General of the army, and immediately set about reorganization of the service. With the establishment of the new grades introduced by Lovell, Beaumont applied for readmission into the army,



FIG. 3. BEAUMONT'S QUARTERS AT MACKINAC.

December 4, 1819. He was immediately ordered to report to General Macomb for duty at Fort Mackinac.²⁰ This he did, after a short visit to his relatives in Connecticut, arriving at Fort Mackinac on the evening of June 16, 1820, and on June 18, 1820, he assumed charge of the hospital and began his long and honorable service in the U. S. Army.

When Beaumont reentered the army, he left behind him at Plattsburgh a young widow, Deborah (Green) Platt, who had become his fiancée. She was a "young woman of much culture, and great strength of character, generous, genial, industrious, sympathetic, and endowed with physical beauty." It is no wonder that his whole heart was not in his work and that he longed for her companionship. Accordingly he applied in March, 1821, for leave of absence to return to Plattsburgh to be married. This was granted on the condition that he obtain some one to supply his place while absent. He left Mackinac August 9, 1821; was married soon after his arrival at Plattsburgh, August 28, 1821, and he left at once for Mackinac.

Mrs. Beaumont showed her Quaker lineage by her hospitality,

and exercised a refining influence over her husband's fellow-officers; there were at this time but twelve

who were busily engaged in exchanging their pelts for other commodities. "A gun was accidentally discharged,



FIG. 4. HOUSE WHERE ALEXIS WAS WOUNDED.

white women on the island. The Beaumonts had their home within the fort, and in time their little daughter, Sarah, arrived to brighten their life.

The history of the American Fur Company, interesting as it is, forms too long a story to be told here. The War of 1812 put an end to the schemes of John Jacob Astor, and Mackinac became the center of a



FIG. 5. ALEXIS' HOUSE AT MACKINAC.

series of trading posts. Later, another of his posts, Prairie du Chien, entered into the life of Beaumont. In the meantime, however, an important event happened at Mackinac, important in the life of Beaumont, and important in the history of physiology.

On June 6, 1822, the retail store of the American Fur Company was crowded with Indians and voyageurs

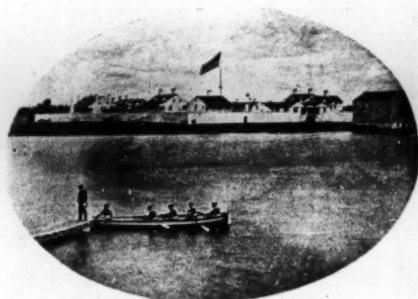


FIG. 6. FORT HOWARD.

and a young voyageur dropped to the floor, with a cavity in the upper abdomen that would have admitted a man's fist." Such is the origin of the wound in the stomach of Alexis St. Martin.

The story of the care of Alexis during his long and tedious recovery

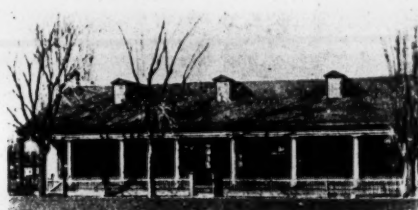


FIG. 7. OLD HOSPITAL AT FORT HOWARD. THE BUILDING IS STILL STANDING.

has been fully told by Beaumont and by Myer, so a repetition is not necessary; the only fact to be noted here is that during this period, in addition to his own family, Beaumont supported Alexis, and that his salary was \$40.00 a month with two to four rations daily.

In the latter part of May, 1825, Beaumont was transferred to Fort Niagara; but previous to his removal he had begun in a desultory way his

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first experiments. In July he was granted a two months' furlough and he left Niagara for Plattsburgh, taking



FIG. 8. BEAUMONT'S QUARTERS AT FORT HOWARD. THE BUILDING IS STILL STANDING.

Alexis with him. Here he conducted his first series of four experiments. The proximity of Plattsburgh to his old home in Canada caused Alexis to

Wisconsin Territory, where he arrived early in June, 1826. Here he spent two enjoyable years, built up a reputation as a successful practitioner and surgeon, and acquired considerable property which is still in the possession of the family.

"The Beaumont homestead in Green Bay is filled with treasures inherited from the handsome St. Louis residence," Beaumont's home after leaving the army.

In 1828, Beaumont was ordered from Fort Howard to Fort Crawford, Prairie du Chien, Wisconsin, where he arrived August 10, 1828. Beaumont's life at Fort Mackinac, and at Fort Howard, has been described by Myer, and that at Fort Howard has also been described by Deborah Beaumont Martin. Although Beaumont's second series of experiments (56 in number)

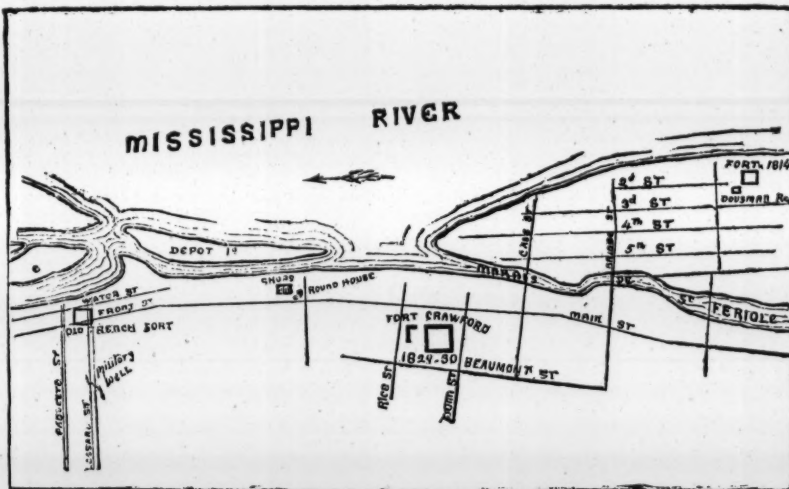


FIG. 9. MAP SHOWING THE SITUATION OF THE VARIOUS FORTS AT PRAIRIE DU CHIEN. (FROM Wis. Hist. Coll. 9:288, 1882.)

take "French leave," and the experiments came to a temporary end.

Late in May, 1826, Beaumont received orders to accompany the troops to Fort Howard, Green Bay,

where they were conducted at Fort Crawford, beyond the bare fact practically nothing has appeared in print concerning Beaumont's life at Prairie du Chien except the few items given by Myer.

The history of "Old Fort Crawford" has been told in a very interesting manner by Bruce E. Mahon, but he



FIG. 10. THE FIRST FORT CRAWFORD. THIS WAS BUILT ON THE SITE OF THE FORT OF 1814. ITS POSITION CAN BE SEEN IN FIG. 9. THE BARN BELONGING TO THE PRESENT DOUSMAN RESIDENCE COVERS A PORTION OF THE FIRST FORT CRAWFORD.

says nothing about Beaumont and his experiments.²¹

The flood plain situated just above the confluence of the Wisconsin with the Mississippi has played an important part in the conquest of the North West. "It was a convenient meeting place for the Indians and the traders of the Upper Valley." In 1685, a Frenchman, by the name of Perrot, established a series of forts, or trading posts, along the banks of the Mississippi, and one of them was situated on the lower edge of this plain. By another century Spanish, British and American traders had come into this region, and a trader's war was carried on between them for the control of the fur trade and for the territory bordering on the Mississippi. For a time the Spanish and British held the upper hand, but with the "Louisiana Purchase" in 1803, both sides of the Mississippi came under the control of the Americans.

On the declaration of war with Great Britain in 1812, the British called the Indians to their aid. Robert Dickson "became a successful recruiter of Indians for the British

service," and was appointed superintendent for the Indians west of Lake Michigan.²² There was danger of the control of the Upper Mississippi passing into the hands of the British. This led to the building of a fort in 1814, at Prairie du Chien, which was named Fort Shelby, in honor of the Governor of Kentucky. As soon as this was known, a force of British sympathizers and Indians was assembled by Dickson and, under the command of Lieut. Colonel McKay, they marched against Fort Shelby. They arrived at Prairie du Chien July 17, 1814. After a two days' siege the fort surrendered, and was rechristened Fort McKay, in honor of its captor.²³ On May 20, 1815, official word reached Fort McKay that peace had been restored between the United States and Great Britain, and two days later, May 22, 1815, the fort was evacuated and the British control of the Upper Mississippi ended.²⁴

The signing of the treaty at Ghent did not, however, bring peace to the Northwest. The British traders still held their influence over the Indians and at the same time continued to smuggle goods from Canada into the Upper Mississippi valley. To close the line of communication and reassert control over the Northwest, the U. S. War Department decided to erect a series of forts, and one of them was located at Prairie du Chien.

Fort McKay had been burned after its evacuation by the British. The new fort, which was named Fort Crawford in honor of the Secretary of War, was built in 1816, on the site of the former Fort Shelby or, as it was called after its occupation by the British, Fort McKay.

The location was unfortunate. Being situated on the flood plain of the

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Mississippi it was subject to occasional inundation; for, in its early as well as its late history, the Mississippi has



FIG. 11. THE NEW FORT CRAWFORD. FOR ITS POSITION AND RELATION TO THE OLD FORT, SEE FIG. 9. THE BUILDING AT THE EXTREME RIGHT OF THE FIGURE IS THE HOSPITAL. FROM THE GATE IN THE RIGHT FOREGROUND IT WAS ONLY A FEW STEPS TO THE BANKS OF THE MISSISSIPPI.

overflowed its banks. In 1822, a flood covered the parade with between three and four feet of water and, entering the quarters of the garrison, it compelled the officers and soldiers to encamp for nearly a month on the high ground back of the fort. Atwater describes the situation of the fort as being too low, and "that nearly every summer, during the dog days, its site is under water from six to ten feet in depth, from the overflow of the river."²⁵ From this time on a series of reports to the War Department criticised the situation of the fort, not only because of its being subject to floods which saturated the floors and timbers of the fort with a damp sediment which caused much sickness, but also because it was undesirable from a military standpoint. Matters were hastened by a flood in May, 1826, which covered the site of the village of Prairie du Chien and the fort with such a depth of water that steamboats could pass over it, and caused the fort to be abandoned for the time being.²⁶

An official inspection of the fort in August, 1826, showed that it was "unfit for occupancy without extensive repairs." This fact, taken in connection with its frequent inundation, led to the issuing of an order

in October, 1826, for its permanent abandonment. Early in 1827, however, the threatened outbreak of war with



FIG. 12. FROM AN OLD PHOTOGRAPH OF UNCERTAIN DATE. THESE ARE NOT THE RUINS OF THE FORT, BUT ARE THE RUINS OF THE HOSPITAL BELONGING TO THE NEW FORT, WHICH CAN BE SEEN ON THE EXTREME RIGHT OF FIG. 11. THE BARRED PRISON WINDOW "BEHIND WHICH CAPTURED INDIANS AND OFFENDING SOLDIERS HAD CHAFED AT THEIR IMPRISONMENT" (MAHON), HAS BEEN REMOVED AND PLACED ON THE CAMPUS OF SAINT MARY'S COLLEGE, SOME OF WHOSE BUILDINGS APPEAR IN THE BACKGROUND OF THE PHOTOGRAPH.

the Winnebago Indians caused the reoccupation and repair of the fort.

Early in 1829 the commandant of Fort Crawford was directed, without delay, to select a new site for the fort. A preliminary survey had already been made, and a plot about two miles south of the "old fort" was selected and purchased. Work was begun in May, 1829, on the new fort (the old name being retained, they spoke of the "Old Fort" and the "New" Fort Crawford), but it was not completed until 1834, work being interrupted by the Black Hawk War and an epidemic of cholera in which 100 soldiers died.

It was into these surroundings that Beaumont moved when ordered from Fort Howard, where he and his wife had formed many friendships in the garrison and in the little village of Green Bay on the opposite side of the river, and where they had been comfortably housed in a building which is still standing.

Atwater²⁵ mentions some of the hardships with which the officers and their families had to contend at Fort Crawford:

Lieut. Col. Z. Taylor, has been in the Indian country constantly with his family about twenty years. Here he and his lady, who were bred up in the most polished and refined society, have been compelled to rear up as well as they could, a worthy and most interesting family of children. Col. Taylor commands Fort Crawford, at Prairie du Chien. Dr. Beaumont and his amiable and accomplished lady; Major Garland and his, belonging to this garrison, are doing the same. It is an interesting sight, to see such persons located as they are, in a fort, on the very verge of civilized life, educating a family of young children.

The officers of the fort had a library and reading room, which they maintained at their own expense, that contained not only general literature, but also works on geography, mathematics, chemistry and other sciences connected with their profession.

Where Beaumont lived at Fort Crawford is uncertain. At Fort Howard the surgeon's quarters were outside of the fort proper, but at Fort Crawford they seem to have been within the fort, and I can find no evidence that he ever lived at the new fort. Lockwood, in his "Early Times and Events in Wisconsin"¹⁸ says: "In 1831 it [the new fort] was occupied with a part of the troops, leaving the sick in the old hospital, and the surgeon in the new fort." Dr. P. L. Scanlon, of Prairie du Chien,²⁷ writes me that it was December 16, 1830, that this removal of a portion of the troops from the old to the new fort took place.

The quarters occupied by St. Martin at Mackinac are known; but where

he lived at Prairie du Chien and where Beaumont's experiments were performed is uncertain. As already stated, it is probable that Beaumont occupied quarters within the old fort, and St. Martin must have lived in the immediate neighborhood; for "he performed all the ordinary duties of a common servant." The experiments could not have been performed at the hospital connected with the new fort, for it was not completed until after Beaumont left Prairie du Chien; it seems quite probable, therefore, that they were performed in the log hospital connected with the old fort.

Thus it seems that, though Beaumont performed fifty-six of his experiments at Prairie du Chien and that in many respects they were of great importance, for they formed the basis of all later work, no trace can be found of where they were done. Prairie du Chien has changed the name of Beaumont Street to Church Street, evidently having no desire to perpetuate the fact that at one time the leader in American physiology, and a faithful army surgeon, lived in their midst.

The new fort had an interesting history. It was here, while under the command of Col. Zachary Taylor, that Lieutenant Jefferson Davis wooed and won the heart of Sarah Knox Taylor, the daughter of his commanding officer, and in spite of parental opposition married her. The oft-told tale that they eloped is not true; they were married at the home of her father's sister, near Louisville, Kentucky, with the knowledge, but without the approval, of her father.

Fort Crawford no longer exists. "As long as the Winnebago Indians remained in Wisconsin there was need of a garrison at Fort Crawford."

Eventually a treaty was concluded with the Winnebago which was proclaimed the law of the land on February 4, 1847. Under the terms of this treaty they agreed to remove to a new home in Minnesota. This was finally accomplished in the summer of 1848, and Fort Crawford, being no longer needed, was evacuated in April, 1849. After its evacuation the fort had a checkered career, and was finally sold at auction in 1868. Its site is now occupied by Saint Mary's College, a school for girls. The only part of the fort remaining is the ruin of the hospital. The prison window has been removed from its original position to one on the grounds of the College. Mahon says that the old military cemetery "is now a well-kept park." I found this to be the case when I made a visit to Prairie du Chien, and it reflects credit on the Daughters of the American Revolution, who, I understand, care for it.

St. Martin left Beaumont in September, 1825, and remained in Canada four years; during this time he married and had two children. In 1827, W. W. Matthews, an agent of the American Fur Company, discovered the whereabouts of St. Martin and communicated the same to Beaumont; but it required two more years before he could be induced "after considerable difficulty, and at great expense," to again enter the employment of Beaumont. At the end of that time, in August, 1829, St. Martin and his family were transported from Canada to Prairie du Chien, Wisconsin, a distance of nearly two thousand miles. Here he remained until March, 1831, and:

During this time, in the intervals of experimenting he performed all the duties of a common servant, chopping wood,

carrying burthens, &c., with little or no suffering or inconvenience from his wound. He labored constantly, became the father of more children, and enjoyed as good health and as much vigor as men in general. He subsisted on crude food, in abundant quantities, except when on prescribed diet, for particular experimental purposes, and under special observance.

Eight experiments between December 6, 1829, and March 16, 1830, were devoted to ascertain any variation in the gastric temperature and whether the atmospheric temperature had any influence. Beaumont found that the ordinary temperature of the stomach was 100°F., "a dry atmosphere increasing, and a humid one diminishing it."

Fifteen experiments were made to ascertain whether the "gastric juice accumulated in the stomach, during periods of fasting, or even from the immediate and direct influence of hunger."

As the result of these experiments he found "that the stomach contains *no gastric juice*, in a free state when aliment is not present. Any digestible or irritating substance, when applied to the internal coat, excites the action of the gastric vessels. Hence I infer that the fluid, in these experiments, was incited to discharge itself by irritation of the tube used in extracting it." (See page 159.) From the last of this series of experiments, which was conducted while St. Martin complained of some headache and loss of appetite, Beaumont concluded that "in febrile diatheses, very little or no gastric juice is secreted. Hence the importance of withholding food from the stomach in febrile complaints." This does not agree with modern practice, for even in typhoid fever the custom is to give a liberal allow-

ance of food. I well recall that when a medical student at Yale, in 1878, our professor of surgery, David P. Smith, used to say with great emphasis: "Feed your patient."

A series of twenty-three experiments "were instituted with the view of ascertaining the relative difference between *natural* and artificial digestion; to demonstrate the performance of digestion *out of the stomach*, by gastric juice; and, also, the continuation of the natural process, when *taken out* during the period of chymification."

The first experiment in this series was inconclusive. He thought it probable "that different kinds of diet required different proportions of gastric juice for their solution" (see page 157) and that "a given quantity of the fluid acts on a definite proportion of aliment, when it becomes saturated, and is inadequate to produce any further effect. There is always disturbance of the stomach when more food has been received than there is gastric juice to act upon it."

The second experiment (experiment 25) was more satisfactory. I give it in detail:

Dec. 16. At 2 o'clock, P.M.—twenty minutes after having eaten an ordinary dinner of boiled, salted beef, bread, potatoes and turnips, and drank a gill only of pure water, I took from his stomach, through the artificial opening, a gill of the contents, into an open mouth vial. Digestion had evidently commenced, and was perceptibly progressing, at the time. This vial and contents were immediately placed in a basin of water, on the sand bath, at 90° or 100°, and continued there for five hours.

The digestion of the contents continued to progress, until all was completed.

At 7 o'clock—five hours after eating his dinner—I took out a gill of pure chyme; no particles of undigested food appeared in the mixture.

Very little difference was perceptible between this last parcel and that in the vial, digesting on the bath. The stomach had digested a little faster and more perfectly than the vial.

As the result of this experiment he found "that a quantity of aliment, taken out of the stomach *twenty minutes* after having been eaten, had a sufficient admixture of gastric juice to cause perfect digestion when placed on the sand bath."

For experiment 26, St. Martin was given at 3 o'clock, P.M., a meal which consisted of bread, salted lean beef, potatoes, and turnips, boiled. In fifteen minutes digestion of the meat was established. At the end of forty-five minutes a second sample was taken "put in a vial, and placed in water, on the sand bath, at the temperature of the stomach" (100°F.). At the end of two hours a third sample was removed and, like the second, placed in a vial on the sand bath. Three hours after the meal, another sample was taken, and placed on the sand bath. As the result of this experiment Beaumont found that "vegetables are less easily disposed of by the gastric organs, than animal or farinaceous substances."

Experiment 27 demonstrated that milk was coagulated by the gastric juice before digestion took place, and experiment 30 showed that, although fresh egg albumen did not present the same mass coagulation as milk, it did present "small flocculi, or loose coaguli." Experiment 31 demonstrated that *cold* gastric juice had little or no effect on food, but that when placed on the sand bath digestion began and continued regularly. It also showed "that after the process of digestion has ceased, for want of a sufficient quantity of gastric juice, it

will recommence on the addition of a fresh supply."

Experiment 32 yielded unique results. Four hours after eating a breakfast of fat pork, bread and potatoes, Beaumont "took out a portion, in a complete chymous state, without any entire particles of food to be seen;" but he found it "considerably tinged with yellow bile." Beaumont attributed the presence of bile to the fact that St. Martin became violently angry "about the time of taking out this parcel."

In experiment 35 a meal consisting of a pint of milk and four ounces of bread was digested "something shorter than the usual time for the disposal of an ordinary meal. For those who have healthy and *unsophisticated* stomachs, milk appears to be one of the best articles of diet we possess"—a conclusion which is supported by modern practice. The succeeding eleven experiments showed the digestibility of various articles of food.

Beaumont thought that the experiments thus far recorded "plainly demonstrate the *solvent* properties of the gastric juice. When aliment is submitted to it *out of the stomach*, its operation is rather slower than when the process of digestion is assisted by the *natural warmth and motions* of that organ." He thought the inability to maintain his sand bath at a constant temperature was one of the reasons for the slower artificial digestion. With the modern apparatus for maintaining a constant temperature, this difficulty could have been overcome.

That the *cold* gastric juice should not act at all, or but imperfectly, on aliment, is no proof, in my opinion, that it does not possess solvent powers . . . It is perfectly manifest, that its operation is that

of a chemical agent; that it dissolves aliment out of the stomach, when the warmth and motions of that organ are imitated; and that it changes the various and heterogeneous articles, submitted to its action, to an uniform, homogeneous semi-fluid, varying, however, slightly in color and consistency, according to the aliment used.

Ten experiments were made "to ascertain, if practicable, what effects were produced by the BILE and PANCREATIC JUICE, when added to CHYME." Since he was unable to procure human bile, Beaumont made use of *beef's gall*, and in place of pancreatic juice he used dilute hydrochloric acid. Of necessity the experiments were imperfect and the results unsatisfactory.

This closes the account of the fifty-six experiments performed at Prairie du Chien. When it is taken into consideration that they were performed with inadequate equipment, at an army outpost far removed from civilization, the accuracy of his observations are all the more remarkable. The remaining experiments described in his book were performed elsewhere, and do not enter into this account of Beaumont's life at Fort Crawford.

Early in 1831 circumstances²⁸ made it expedient for St. Martin to return to Canada, and this time he went with the consent of Beaumont; for he felt sure that St. Martin would keep his promise to return for further experiments. In the meantime, however, Beaumont felt the need of such assistance as only a physiological chemist could give. Knowing that there was no reliable person in this country, he applied for a furlough of one year, to begin in September, 1831, in order that he might go abroad with St. Martin.

On May 23, 1831, Surgeon-General Lovell wrote Beaumont that as soon as arrangements could be made to relieve



FIG. 13. WILLIAM BEAUMONT AT THE TIME HE LIVED IN ST. LOUIS. REPRODUCED FROM A PHOTOGRAPH GIVEN ME BY BEAUMONT'S GRAND-DAUGHTER, MISS MARY BEAUMONT, OF GREEN BAY, WISCONSIN.

him, the furlough would be granted. Accordingly on July 13, 1831, "Special Order No. 78" was issued from the adjutant-general's office directing Assistant-Surgeon Elwers to relieve Beaumont, and permission was granted to visit Europe. The way now seemed clear for Beaumont to carry out his plan to obtain the aid of the physiological chemists in Europe. But just as he was ready to start, "Special Order No. 127" was issued on October 24, 1831, stating that: "The public service will not permit the absence of Surgeon Beaumont from duty at this time; accordingly the indulgence intended to have been accorded him in Special Order No. 78 is recalled until otherwise directed."

The occasion of this recall was the threatened outbreak of the "Black

Hawk Indian War," which actually began in the spring of 1832.²⁹ Fort Crawford was near the center of this disturbance, and Beaumont went out with the troops from the fort to take part in the hostilities. With the defeat of Black Hawk in the battles of July 21 and August 2, 1832, peace was restored and Beaumont returned with his regiment to Prairie du Chien.

In the meantime Asiatic cholera broke out in the troops which were being rushed from Fortress Monroe and from New York harbor, and the disease was spread broadcast by the desertion of soldiers who attempted in this way to escape infection. Troops marching from Chicago to Fort Crawford carried the disease to Prairie du Chien and the Upper Mississippi. Although they did not reach the seat of war until after the conflict was over, they suffered more severely than the troops which took part in the conflict. These two events gave Beaumont new experiences; in fact the Black Hawk War was afterwards called the "cholera campaign" in army circles.

Early in June, 1832, "Special Order No. 79" was issued from the adjutant-general's office which granted to Beaumont a six months' furlough, with permission to visit Europe, "as soon as his services can be dispensed with." The Black Hawk War being over and the cholera epidemic under control, Colonel Zachary Taylor, the commandant at Fort Crawford, issued August 22, 1832, the final order which permitted him to leave Fort Crawford and at the same time directed him to attend the wounded militia as far as St. Louis where they were to be left in the hospitals. He evidently left the following day, and after attending the wounded militia as far

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as St. Louis, immediately left for Plattsburgh. In September he reported himself, and his family, there, 19 years old" at the time of the accident; but if the statement of the Rev. Mr. Chicome, the curé of St. Thomas,



FIG. 14. ALEXIS ST. MARTIN AT SIXTY-SEVEN!

"in quest of his man St. Martin," who promptly, according to his promise, put in his appearance.

For an account of Beaumont's disappointment in not being able to go to Europe, his further experiments, the final desertion of St. Martin, his ill-treatment by the War Department, his resignation from the U. S. Army, and his life and death, April 23, 1853, at St. Louis, the reader is referred to the excellent account by Myer.⁵

ALEXIS ST. MARTIN

Any account of "that old fistulous Alexis" as he was termed by Beaumont in a letter to his cousin, Dr. Samuel Beaumont, must follow the scattered items in Beaumont's book, the account by Myer⁵ or the more extended account given by Osler.⁶

Beaumont says Alexis was "about



FIG. 15. ALEXIS ST. MARTIN AT EIGHTY-ONE.

be accepted as correct, he was twenty-five years old at that time.

After his desertion of Beaumont in 1834, Alexis wandered from place to place, sometimes exhibiting himself at different medical schools. Myer says "in 1870 he and his family were in Cavendish, Vermont, where he earned his livelihood by 'chopping wood by the cord.'" It must have been while he was living in Cavendish that the accompanying photograph was taken. In 1879 Alexis was back in St. Thomas, Canada. There is *no* evidence that Alexis ever visited England.

Alexis Bigigan, *dit* St. Martin, died June 24, 1880, and Osler, at that time, was living in Montreal. He at once took active measures to secure a necropsy, or at least the stomach, but was unsuccessful. Osler says:

The family resisted all requests, most pressing as they were, on the part of the members of the medical profession for an

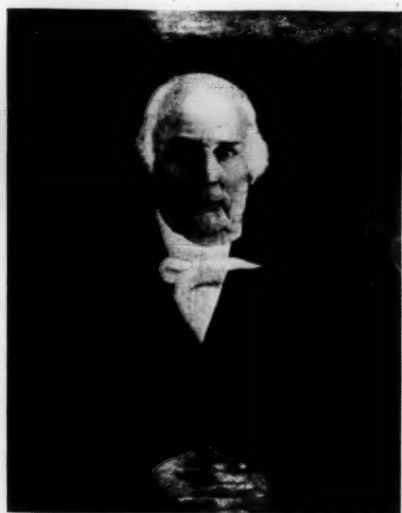


FIG. 16. ELISHA NORTH. REPRODUCED BY PERMISSION FROM STEINER'S SKETCH OF ELISHA NORTH IN THE *Johns Hopkins Hospital Bulletin*.

autopsy, and also kept the body at home much longer than usual and during a hot spell of weather, so as to allow decomposition to set in and baffle, as they thought, the doctors of the surrounding country and others. They had also the grave dug eight feet below the surface of the ground in order to prevent any attempt at resurrection.

At the time of his death, Alexis was eighty-three years old; he left a widow and four children. His widow survived him nearly seven years. During his later years Alexis became addicted to drink, "almost a drunkard one might say." He was described, in his old age, as "a tall, lean man, with a very dark complexion, and appeared of a morose disposition."

ELISHA NORTH

Elisha North was born in Goshen, Connecticut, January 8, 1771, and

was the son of Joseph North, Jr., and Lucy (Cowles) North. His father had a reputation as a "bone setter" and, although he was not educated as a physician, he had studied for a short time with Dr. Joel Soper, a local physician.³⁰

Elisha North began his medical studies with his father and later studied under Dr. Lemuel Hopkins of Hartford, Connecticut. In the spring of 1793, he was elected a member of the Connecticut Medical Society, and in the fall of the same year he entered the medical department of the University of Pennsylvania, but did not remain for graduation. In 1797 he married Hannah Beach, of Goshen, and began the practice of medicine in his native town.

In 1798, Jenner published his classic on vaccination with kine-pox as a preventative against smallpox, and in 1800, Dr. Benjamin Waterhouse³¹ and Dr. James Smith³² of Baltimore introduced vaccination into their local practice. In May, 1801, North discovered a cow-pox pustule on the hand of one of his patients. This was probably the first case found in this country. I do not know whether North possessed a copy of Jenner's book, but I do know that he was intensely interested in the subject, for I have in my library his copy of John Redman Coxe's³³ "Practical Observations on Vaccination or Inoculation for the Cow-pox," with its well-studied "colored engravings" depicting the different appearances of vaccine and smallpox, from the third to the twentieth day. This copy does not bear his well-known autograph; he evidently had a metal stamp of some kind, for in the center of the second blank page there is the impression "Elisha North's." Coxe knew of

North's case and he says that he wrote to him asking for further information, but apparently no reply was received. "Vaccination as it was practiced in Goshen" forms Chapter VIII in North's "Outlines of the Science of Life."

In the early part of the last century an epidemic of spotted fever, or cerebrospinal meningitis, swept through New England and North had his share of cases. His treatment seems to have been more successful than many of his fellow practitioners, for he says: "I have myself treated more than two hundred patients with this disease; of these I have lost two." The results of his experience in this epidemic he eventually published in a book entitled "A Treatise on a Malignant Epidemic, commonly called Spotted Fever."³⁴

In 1812, on the invitation of the citizens of New London, Connecticut, he removed to that city, and on July 1, 1812, he announced to the public that he was ready to practice physic, surgery and midwifery. Some years later he added to these ophthalmology. "His skill and interest in this last specialty, ophthalmology, had caused him to open an eye infirmary in New London, in 1817, which was the first institution of its kind in this country" (Steiner).

North published a number of short articles in various medical and scientific journals, some of which appeared before, and others after going to New London. His most important publication, after establishing himself in New London, was his "Outlines of the Science of Life."³⁵ Steiner describes the book as being "Extremely discursive, abounds in quotations from Pope and contains a quaint collection of pithy epigrammatic sayings." That

he was an omnivorous reader is shown by his quotations from Servetus down through Erasmus Darwin, John Hunter, Benjamin Rush, Bichat and John Brown, to a writer of his own time, William Beaumont. Preceding his reference, in a lengthy footnote, to Beaumont's work, he says: "The stomach, like a wife, has more power at home than any other organ in the whole family of organs and parts: and it should be so, for the whole animal mass is very dependent on this very important part." The footnote itself is interesting in that it not only contains abstracts from the first series (1825) of Beaumont's experiments, but also because in it North says that he obtained his information "from a highly interesting manuscript, a part of which has been published, loaned by my venerable friend, Dr. Swift."³⁶

As already stated, North owned a copy of Beaumont's "Experiments and Observations" and, what is surprising, he also had a sample of the gastric juice from St. Martin's stomach that had been given him by Beaumont. I found within his copy of Beaumont, a number of manuscript notes dealing with this sample. The notes appear to have been, either drafts of a letter to Beaumont, or else intended for publication in some periodical. No date is attached to any of these notes and it is impossible to assign the exact year in which they were written. Beaumont was, as Medical Director, on a tour of inspection of hospitals, at Fort Trumbull (New London) in the spring of 1834. North says his sample of gastric juice was given him at the time Beaumont was in New London, and that he had kept it nearly six years. This seems to establish 1839 or 1840 as the date of the notes.

The first two notes are in the form of "Memmoranda" and differ somewhat, though in general they have the same phraseology.

MEMORANDUM

I have in my possession two drachms of pure gastric juice which has been kept in a small vial which has been — times uncorked to smell or taste the fluid. This juice was taken by Dr. Beaumont's tube from the morbid perforation of the stomach of Alexis St. Martin, renowned by misfortune. It has been kept among my vials of medicine both summer and winter in a room generally without fire, and where water and liquors often freeze, I have never seen it frozen though now kept nearly six years. Dr. Beaumont had preserved gastric juice 11 months only when he published his book. Can this fluid be preserved without change as long as the bones, teeth, and hair of a human being?

If you make a note of the above fact, or experiment, please to send one copy of the same to me.

E. N.

The second note is incomplete. In places the writing is so badly faded and the edges of the paper so much worn that it is impossible to decipher the words.

MEMORANDUM

I have in my possession, two drachms of pure gastric juice, taken by Dr. Beaumont's tube, at my verbal request, from the morbid aperture of the stomach of Alexis St. Martin who, like many others, has been made renowned by misfortune. This fluid has been kept in my office both winter and summer nearly six years.

It is preserved in a vial, which has only been uncorked occasionally to smell or taste the fluid. I have never noticed it to be congealed ("frozen" crossed out), although watched for that purpose, yet aqueous liquors and dead tissues would often be frozen on the same shelf.

Dr. Beaumont had preserved gastric juice only eleven months when he published his book yet he might have done more in this single respect (the remainder of the paragraph missing).

Can this *vital* fluid, if it be such, be preserved without change as long as the bones, teeth and hair, *even when deprived of vitality*? Was not the molecules of this

E. N., M.D.

fluid once, if not now alive, like the blood, from which it is made? Or is this suggestion too visionary? Some will think it so without doubt, yet the late Dr. Darwin would . . .

P.S. If you make a record of the above experiment please to send one copy of the same to me that I may know that the act is done. I may not live to cause it to be done here after. Moreover may it not be partly a chemical and partly a vital entity.

It is evident that North had read Experiment 34 of the second series carefully, for I find the following marked in his copy of Beaumont: "The fluid in the vial had been taken out when the stomach was in a morbid condition, and had been permitted to get cold, even to the freezing point." North evidently wanted to test the effect of cold on the gastric juice.

Although the following continues the discussion of Beaumont's experiments, it does not appear to be a continuation of the above note which apparently ended with the word *vitality*; for he had placed his initials just beneath. He then had an afterthought, continued the note, and finally brought it to a close with a postscript:

It is known that the vitality of some vegetables and some animals is not destroyed by frost. I have proved by experiment that a like law exists in regard to the human gastric juice, and for the first time in the annals of science. It may be curious, if not otherwise useful to

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record the fact. This juice is known to be a vital secretion done by the stomach, instead of a chemical retort. It must, therefore, be more physiological to regard it a vital instead of a chemical menstrum.

Neither do we regard the menstuous secretion as chemical. In illustration, two drachms of gastric juice was given me by the well known Dr. Beaumont, when he was in N.(ew) L.(ondon), as taken by his tube from the stomach of Alexis St. Martin the once wounded and now mutilated Canadian. This has been kept in a small vial 6 years winter and summer, in a room without a fire. I have seen it frozen and thawed I know not how many times. It is now as sweet, clear and fresh, as when it first came into my possession. It could doubtless be made to digest animal and vegetable food. It does not freeze as readily as water. Would any other human juice or secretion resist the action of frost to such a degree as the gastric juice? The menstuous secretion is said to last for many years, whether frozen and thawed is not told.

For a moment North's mind wanders from his subject and the following two lines are interpolated:

Motto: Every citizen may freely speak, write, and publish his sentiments on all subjects.

He now returns to his discussion of Beaumont's experiments which had for the moment been interrupted. Possibly he had an idea of using the motto in connection with the publication of his "experiment."

Is there any pure chemical material which will operate so readily upon such a multitude of very diversified substances as is the case with gastric juice? Is there any omnivorous menstrum like this under . . . among the purely chemical agents? Is the gastric juice omnivorous, in the lowest grade of animal organization? Is there any power, save the play of very limited affinitive (?) among chemical

. . . ? Do not the philanthropic Dr. Beaumont's 237 experiments, somewhat confirm the common experience of mankind as to what is proper to eat and drink, and how the act is to be done? If so the mislabour of the Grahamites³⁷ can scarcely be wanted. The 8 years practice of Dr. Beaumont upon the gastric juice of St. Martin has been highly instructive to a part of the human race—both men and brutes can live without such instruction—provided they can get food and drink.

On another slip North discusses the question of a National or a State currency, and he ends by saying: "We want a *National* currency in preference to that of the States, i.e. many persons do."

Apparently Dr. North could not make up his mind whether he had or had not seen his sample of gastric juice frozen. First he says: "I have never seen it frozen;" then "I have never noticed it to be congealed;" finally he says "I have seen it frozen and thawed I know not how many times." I may not have placed these notes bearing on the question of the freezing of the gastric juice in their proper order; but it appears to me the short "memmorumandum" he first wrote had gradually developed into the longer one.

The motto which was interpolated in the last note had been used by North in connection with Chapter VII of his "Science of Life." It was taken from the political constitution of the State of Connecticut, and reads in full as follows: Clause 5. "Every citizen may freely speak, and write, and publish his sentiments on all subjects, being responsible of the abuse of that liberty." Clause 6. "No law shall ever be passed to controul the liberty of speech or of the press." The chapter, at which the

above motto stands at the head, deals with the rights of anatomists to dissect the human body.

Dr. North died December 29, 1843. Had he lived ten days longer he would have rounded out seventy-three years of life.

Some statements specially marked by Elisha North in his copy of Beaumont's "Experiments and Observations:"

Dyspepsia is oftener the effect of over eating and over drinking than of any other cause. [p. 51.]

The nerves are the media of communication from the sensible parts to the center of perceptions. They warn the encephalon not only of the injuries, but of the wants of the tissues. [p. 56.]

I am persuaded that moderate exercise conduces to healthy and rapid digestion . . . Exercise, sufficient to produce

moderate perspiration, increases the secretions from the gastric cavity, and produces an accumulation of a limpid fluid, within the stomach, slightly acid, and possessing the solvent properties of the gastric juice in an inferior degree. [p. 94.]

It is dangerous to unsettle long established truths; for it is difficult to limit the extent of error.

The gratification of a morbid desire to be distinguished as the propagator of new principles in philosophy, or as the head of a new sect, is not the only result to be expected from such heresies (the Brunonian theory). New opinions or doctrines, whether true or false, will have admirers and followers, and will lead to practical results. And the errors of one man may lead thousands into the same vortex. [p. 100.]

When a healthy state of the stomach is restored, the tongue invariably becomes clean. [p. 109.]

NOTES

1. The original edition of Beaumont's book was printed at Plattsburgh, N. Y., in 1833. In 1834, copies of the Plattsburgh edition were issued by Lilly, Waite & Co., of Boston. In 1838, Dr. Andrew Combe issued an edition of Beaumont at Edinburgh with notes. This he still further elaborated, and I have an edition issued in 1842, which bears the title "The Physiology of Digestion, considered with relation to the Principles of Dietetics." A second edition of Beaumont was issued at Burlington, Vt., in 1847. This is a reprint of the first edition with typographical and grammatical corrections by Dr. Samuel Beaumont, William Beaumont's cousin.
2. Two dollars was the retail price of the book. I find that on July 11, 1834, the Rev. Joseph Kemper, missionary Bishop in the Protestant Episcopal Church for the Northwest Territory, while on a tour to Green Bay, Wis., bought a copy for that amount. *Wis. Hist. Col.*, 14:397, 1898.
3. Hezekiah Harvey Baldwin's name does not appear among the chemists listed

by C. A. Browne of the Bureau of Chemistry, Washington, D. C. It seems proper, therefore, to give some of the facts I have been able to find in regard to this, at one time, manufacturing chemist. Mr. A. J. Wall, Librarian of the New York Historical Society, has been of material assistance in my search.

Hezekiah Harvey Baldwin was the son of Hezekiah and Elizabeth (Hine) Baldwin and was born in Woodbridge, Conn., February 17, 1790. He graduated from Yale College in 1810, and became a manufacturing chemist in New York City, a business quite profitable during the war of 1812, but much hurt by the peace. According to the index of New York deeds, he bought real estate in New York City in 1813 and 1817. His property was sold by the Sheriff in 1819.

F. B. Dexter's "Biographical Sketches of the Graduates of Yale College" (6:298-299) says he was prepared for college by the Rev. Amasa Porter of Derby, Conn. After graduating from Yale he established himself in New York in the

business of manufacturing sulphuric acid and other chemicals.

- A younger brother (Marcus Baldwin) had shown some aptness in chemical research and analysis, and with the encouragement of Dr. Isaac Goodsell of Woodbridge, he went to Paris about 1812 for study, and while there surreptitiously obtained a knowledge of the French methods of manufacture. With this brother, Hezekiah entered into partnership in New York; but the close of the war with England broke up a profitable business, and after that he was not very successful. About 1824 he returned to Woodbridge, and after a long period of feebleness, died there January 13, 1826.
4. KELLY, H. A. John R. Young, pioneer American physiologist. *Johns Hopkins Hosp. Bull.*, 29: 330, 1918. MILLER, W. S. Thomas Ewell. In: *Amer. Med. Biographies*. Balt. 1920, p. 373. During the preparation of this manuscript, Prof. W. J. Meek's interesting paper "The Beginnings of American Physiology" appeared in the *ANNALS OF MEDICAL HISTORY*, 10: 111, 1928. Prof. Meek has also in preparation a paper in which he discusses in detail not only the three theses mentioned in the text, but also other theses from the medical department of the University of Pennsylvania bearing on the same subject, which appeared about the same time.
 5. MYER, J. S. Life and Letters of Dr. William Beaumont. St. Louis, 1912. Through the courtesy of the publishers, C. V. Mosby Co., permission was given me to reproduce figures 2, 3, 4, 13 and 14.
 6. PROUT, W. On the nature of the acids and saline matters usually existing in the stomachs of animals. *Phil. Trans.* 1: 45, 1824.
 7. The word "proteid" was first used by Hoppe-Seyler; it was later replaced by the word "protein" which was introduced by Mulder in 1839.
 8. "Enzyme" was coined by W. Kühne. See his paper "Ueber die Verdauung der Eiweisstoffe durch den Pankreas-saft." *Virchow's Archiv*, 39: 130, 1867.
 9. PAWLOW (PAVLOFF), I. P. Work of the Digestive Glands. Trans. by W. H. Thompson, Lond., 1902.
 10. Amino Acids. See Fischer, E. Untersuchungen über Aminosäuren, Polypeptide und Protein. Berlin, 1906. Hofmeister had nearly correct ideas of their linkage. Kossel conceived them as the "Bausteine." Our modern conception of the importance of the amino group and peptid linkage comes from Fischer. In assigning any historical authority for developing the amino acids, probably one should, as Lusk does, cite the three names, Hofmeister, Kossel and Fischer.
 11. MAGENDIE, F. *Lehrbuch der Physiologie*. Tübingen, 2: 29 1826.
 12. JACKSON, S. *The Principles of Medicine, Founded on the Structure and Functions of the Animal Organism*. Phila., 1832.
 13. VON FEHLING, H. Quantitative Bestimmung des Zuckers in Harn. *Arch. f. d. physiol. Heilk.*, 7: 64, 1848.
 14. SPALLANZANI, L. *Expériences sur la digestion de l'homme et des différentes espèces d'animaux*. Lausanne, 1785.
 15. CARLSON, A. J. *Control of Hunger in Health and Disease*. Chicago, 1916.
 16. BOLDYREFF, W. The self-regulation of the acidity of the gastric contents and the real acidity of the gastric juice. *Quart. J. Exper. Physiol.*, 8: 1, 1914.
 17. PHILIP, W. *A Treatise on Indigestion and its Consequences*. Lond., 1821.
 18. James Lockwood was born in the town of Peru. N. Y., in 1793. His parents moved to Champlain, N. Y., in 1805. In 1816 he was with the American Fur Company at Green Bay, and later at Prairie du Chien, at that time part of Michigan Territory. In 1830, he was Associate Judge of Crawford County, Wis., and in 1836 a member of the Wisconsin Territorial Legislature. He died August 25, 1857. *Wis. Hist. Col.*, 2: 99, 172, 1856, and 3: 56, 1857.
 19. Little York, often called "Muddy Little York," now Toronto, Canada. See Osler, Sir W. A Backwood Physiologist. In his: *Alabama Student*. London, 1909, pp. 179, 180. Also Lossing. *The Pictorial Field-book of the War of 1812*. N. Y., 1869, pp. 586-595.

20. The early name of Fort Mackinac was Fort Michilimackinac.
21. MAHON, B. E., *Old Fort Crawford and the Frontier*. Publ. by State Historical Society of Iowa. Iowa City, 1926.
22. Robert Dickson, Indian Trader. Robert Dickson emigrated from Dumfriesshire, Scotland, to Canada. His name occurs first in connection with a letter he wrote in 1795, describing the trade routes between Mackinac and the Mississippi river. It is uncertain whether he was at this time an independent trader or a partner in the Northwest Company. "The next twenty years of Dickson's life were spent almost without interruption in the Indian country." In the meantime Dickson became connected, in some capacity, with the Northwest Company and possessed great influence over the Indians. This was still further advanced by his distributing among them in 1811, "his entire stock of goods which cost him at Montreal about \$10,000," to alleviate the distress occasioned by the failure of their crops owing to the great drouth during that summer. Dickson was an ardent supporter of the British, and because of his influence over the Indians he was appointed, in 1813, "agent for the Indians west of the Mississippi at a salary of £200 per annum." In the spring of 1815, he had a quarrel with the authorities and was dismissed from the service. For some years after this he continued to trade with the Indians. Eventually he is said to have returned to Scotland and to have died there. See Cruikshank, E. A. *Wis. Hist. Col.*, 12: 133, 1892.
23. For an account of the capture of Fort Shelby by McKay, see *Wis. Hist. Col.*, 11: 265-68, 1888.
24. For an account of the last days of the British at Prairie du Chien, see *Wis. Hist. Col.*, 13: 154, 162, 1895.
25. ATWATER, C. Remarks made on a Tour to Prairie du Chien, thence to Washington City. Columbus, Ohio, 1831.
26. Daniel S. Durrie in the *Annals of Prairie du Chien* (p. 8) says: "In the month of May, 1826, occurred a great flood of the Mississippi, the highest of more modern times. The water at Prairie du Chien reaching twenty-six feet above low water mark. The troops abandoned the fort and took possession of the higher ground east of the slough."
27. I am indebted to Dr. P. L. Scanlon, the local historian of Prairie du Chien, for many personal communications, and for his courtesy during my visit to Prairie du Chien.
28. Osler says that the "circumstances" were discontent and homesickness of Alexis' wife. See note 7.
29. For the best account of the Black Hawk War, see Thwaites, R. G. *The story of the Black Hawk War*. *Wis. Hist. Col.*, 12: 217, 1892.
30. BOLTON, H. C. Memoir of Dr. Elisha North. *Proc. Conn. Med. Soc.*, 3: 135, 1887, and Steiner, W. R. "Dr. Elisha North, one of Connecticut's most eminent medical practitioners. *Bull. Johns Hopkins Hosp.*, 19: 301, 1908.
31. Dr. Benjamin Waterhouse was born in Newport, R. I., March 4, 1754. He began his study of medicine, at the age of sixteen, with Dr. John Halliburton of Newport. In 1775 he went to London and studied for a time with his great uncle, Dr. John Fothergill; he next spent some time at Edinburgh and in 1779 went to Leyden where, in 1781, he took his medical degree. In 1782 he returned to this country and in 1783 became the first professor of theory and practice in the Harvard Medical School. He also held a professorship in the Rhode Island College, now Brown University, Providence, R. I. He was one of the earliest practitioners to make use of vaccination for the prevention of smallpox. He died October 2, 1842.
An account of his relation to the introduction of vaccination into this country is found in Welch, W. H., *Waterhouse, the Jenner of America*, Phila., 1885. For an account of the attempt by Waterhouse to commercialize vaccination by forming a vaccine trust, see Spalding, J. A., *Dr. Lyman Spalding*, Boston, 1916, Chap. v.
32. Dr. James Smith was born in Elkton, Cecil County, Maryland, in 1771. He was a graduate of Dickinson College and a pupil of Benjamin Rush. Although he had been preceded by Dr. John Crawford in 1800, in the use of vaccination,

he "deserves to be called the Father of Vaccination in Maryland, since he did more than any one to promote its adoption in this community." He began to use the "virus on the first of May, 1801." (Cordell.) In 1809 he became vaccine agent, and in 1813 United States vaccine agent, a position which he held until it was abolished in 1822. He died June 12, 1841, aged 69 years.

33. John Redman Coxe was born in Trenton, N. J., September 16, 1773. After studying medicine for a time in Edinburgh and London, he returned to this country and received his medical degree from the University of Pennsylvania in 1794. Soon after graduating he went again to London, Edinburgh and Paris, returning in 1796 to Philadelphia. He was an enthusiastic advocate of vaccination, and published in 1802, at Philadelphia, "Practical Observations on Vaccination or Inoculation for the

Cow-Pox." He died March 22, 1864, aged ninety years.

34. NORTH, E. A Treatise on a Malignant Epidemic, commonly called Spotted Fever. N. Y., 1811.
35. NORTH, E. Outlines of the Science of Life." N. Y., 1829.
36. I have been unable to identify Dr. North's "venerable friend, Dr. Swift." Dr. Steiner writes me that he may possibly be Dr. Isaac L. Swift of Litchfield, Conn.; this place is about five miles from Goshen, the place where North was born and where he began the practice of medicine. Isaac L. Swift was apparently one of the original members of the Connecticut State Medical Society, being listed in 1793 as a member, the year after the establishment of the State Society.
37. Grahamites, followers of Sylvester Graham (1794-1851) an American writer on dietetics.



DR. JAMES AND HIS MEDICAL DICTIONARY*

By CHARLES W. BURR, M.D.

PHILADELPHIA

ROBERT JAMES, son of Major Edward James, was born at Kinvaston, England in 1705. He went to the grammar school at Lichfield, matriculated at St. John's College, Oxford in 1722, and was graduated B.A. in 1726. He was admitted an extralicentiate of the College of Physicians of London in 1728 and in the same year was created M.D. in the University of Cambridge, by royal mandate. After practising at Sheffield, Lichfield and Birmingham he settled in London. He died in 1776.

His son Pinkstan, a physician, was the father of G. P. R. James, the author of many very popular, melodramatic but flimsy romances. James first became famous or notorious, according to one's point of view, because of a secret powder which he introduced. John Timbs states, in his "Doctors and Patients," that he invented it when a poor apothecary. It became the popular medicine of the day, and he grew rich. He took out a patent for the powder and a pill to be used in conjunction. He deposited in the court of chancery a description of the components and method of manufacture, but it was later proven that the recipe sworn to in the patent would not produce the powder. The chief constituents were phosphate of lime and oxide of antimony. It was diaphoretic, alterative, emetic or purgative, according to the dose. Oliver Goldsmith found it beneficial several times when he was ill, but when it was

given to him in his last illness, and he died, many people said it killed him. Walpole, however, claimed he might have been saved, had not his physician stopped its use. It was used in one of George III's attacks of mental disease, and he improved greatly, friends said because, enemies, in spite of, its use. It also was used in the last illness of George Washington. We must not blame James too much for getting a patent; other doctors of his time did the same.

He wrote many books, but the one we are interested in is his dictionary. It is a huge, three-volume folio with illustrations. The first volume was printed in 1743, the last in 1745. Dr. Samuel Johnson, who for many years was a warm friend of James, wrote the dedication to Dr. Mead. The preface fills ninety-nine pages, and is really a history of medical theory and an account of James's own opinions. The book is the one great medical dictionary in English before the new birth of medicine as a science, in the early part of the nineteenth century. It is the largest, most exhaustive and most learned medical dictionary written in English in pre-scientific days. In one sense it is more learned than any dictionary written in our times but much of the learning is useless, and now forgotten, lore. To the historian it is a storehouse of now dead, once living, dogmas.

James was a conservative by nature, but a close observer. He did not look with great favor on "the new chemis-

* Read at the meeting of the Section on Medical History, Philadelphia College of Physicians, April 17, 1928.

try," the science which has solved so many riddles in physiology and pathology and changed medical philosophy entirely. He quotes, frequently with approbation, many ancient writers, e.g. Hippocrates, Caelius Aurelianus, Galen, Averroes, Aetius, Aulus Gellius, Pythagoras, Pliny (the younger), Aristotle. Paracelsus he quotes many times, and Boerhaave influenced him greatly.

The doctrine of temperament played such a large part in the therapeutics of the older medicine that I shall quote the entire article. It is interesting to compare it with our present-day doctrine of personality, and the influence of the ductless glands in determining it.

Temperamentum. A Temperament, or Constitution. The antient Division of Constitutions was into hot, cold, moist, dry, bilious, sanguine, phlegmatic, and atrabilarious.

The Characteristics of an hot Constitution were said to be, a large Quantity of yellow gross Hairs all over the Body; a redish Colour of the Carunculae Lachrymales, Face, Lips, and Mouth; a slender, agile, robust, and hot Body; a large and frequent Pulse; a Propensity to Anger, which, however, is soon over: Such Persons seem to have robust and contracted Vessels, strong Viscera, and very dense and acrid Humours, in a brisk Motion. Moistening, diluting, and temperating Substances are beneficial; whilst, on the contrary, all heating things are highly prejudicial to such Persons.

The Signs of a cold Temperament are directly opposite to the former; such as a Smoothness of the Skin; small Hairs; a pale Colour; a gross, slow, weak, cold, and easily swelling Body; a small and slow Pulse; Insensibility; and Fearfulness. The Humours of such Persons are mild, aqueous, pituitous, and languid in their Motion, whilst their Solids are lax and flaccid: Corroborative and heating sub-

stances are beneficial, whilst cold, moist, and relaxing Things, are injurious to such Persons.

A moist Temperament approaches greatly to that of the cold Kind; for, if in the former there is a Swelling of the Body, they are, in other respects, the same.

A bilious Temperament is known from the great Quantity of black and curl'd Hairs; and Hardness, Extenuation, and Leanness of the Body; a dark-brown Colour; large Veins; a quick and large Pulse; Obstinacy, and a Propensity to Anger. In such Persons, the solid seem to exceed the fluid Parts. This Temperament approaches to those of the dry and hot Kinds. Hot and drying substances are prejudicial, but moistening and refrigerating Things beneficial, to Persons of bilious Temperaments.

A sanguineous Temperament is discover'd by a small Quantity of Hairs, of a dark-brown, or whitish-yellow Colour; a large Quantity of soft Flesh; large blue Veins; distended with Blood; a redish Colour; a Propensity to Anger; and a flexible Mobility of Body. Evacuating and temperating Substances are beneficial, whereas heating and drastic stimulating Things are pernicious to such Persons.

A phlegmatic Temperament is known from the great Smoothness of the Skin; white, slender, and slow-growing Hairs; a Whiteness, Swelling, Softness, and Fatness of the Body; narrow and latent, or deep-seated Veins. Such Persons seem to have narrow Blood-vessels, but somewhat larger lateral Vessels. This approaches to the cold Temperament; for which Reason, moist and cold Things are prejudicial, whereas heating, corroborating, and drying Substances are beneficial, to Persons of phlegmatic Temperament.

The Signs of melancholic Temperament are, Smoothness; highly black Hairs; extreme Leanness; great Driness of the Skin; and the blackish Colour which is observed in all the Parts of such Persons Bodies; Slowness; Constancy; long Reten-

tion of Anger; and great Penetration of Understanding: For this Reason, such Persons seem to have constricted, robust and lean Vessels, and dense tenacious Humours, so thoroughly mix'd, that their Parts cannot be easily separated or changed. Such Persons are greatly injur'd by hot, drying, and acrid Substances; whereas moistening, refrigerating, relaxing, emollient Substances, and such as gently dissolve without any Acrimony, are beneficial to them.

This Doctrine is of great Advantage in investigating the Natures of those Diseases, which may be foreseen to arise from, and be most incident to, each particular Temperament. Upon this Doctrine, also, depends a great Part of the predisposing Causes of Diseases.

Today, when we are discovering vitamins, and also that animal organs, or at least some of them, have therapeutic uses, and the reasons therefor, the articles on animals and plants and their medical uses are interesting. In the history of human progress art often, indeed usually, precedes science. Therapeutics is an illustration; cod-liver oil, cinchona, digitalis were old wives' discoveries. Science has discovered only recently the reason of their usefulness. Some of the opinions, expressed in the articles I am about to quote, may turn out more correct than they seem, though the reasons are empiric and not based on scientific methods of thought.

The article on the lark is an example of curious reasoning. According to James "It is very useful in all pains in the Colon (for man or beast) and whether it be roasted and eaten, or burnt to ashes and given in warm water for three days." He continues: "As the Lark uses much Exercise, its volatile Salts must be much exalted, and its juices alcalescent, especially

as it feeds sometimes on Insects. As it is much upon the Wing, its Perspiration is abundant, and consequently it must contain but a few given Humours, and many volatile and exalted Principles." James, like the writers of his day and of centuries before, sought and found proof for established, orthodox dogma.

"Aliments." This is a long article, and I have room only for brief extracts: "Sparrow-grass" (this was the polite spelling and pronunciation for asparagus, in the eighteenth century), "is in best repute of all Greens: it creates not the least Molestation to the Stomach in Concoction, is moderately hot, consists of fine Parts; and renders the Blood every Day purer; and if any Green provokes Urine, it is sure to do it."

He says of apples: "They are esteemed Cardiacal, because they repel the smoaky and fuliginous Vapours that annoy the Heart and thence ascend to the Brain." He advises dividing the food of the day into three parts, taking two at noon and the third a little before night for "by this Method, the Brain will have the Benefit of a continual Humectation, Sleep will the more easily be procured, and the Spirits being thus cherished by a perpetual Irrigation, will hold out the longer, nor be liable to take Fire, or be refrigerated, with too long Fasting, for either of these may happen, according to the Difference of Temperaments or Seasons." I am not sure his advice is not wise, though surely his reasoning is fantastic.

"Camelopardus" (giraffe). "The horns and hoofs rasped, pulverized, and taken inwardly, are good for the Epilepsy, stop a loosening, and resist poison." Throughout the book

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James speaks repeatedly of substances as resisting poison, and there seems to have been a universal and ages-old belief that certain things were general antidotes for poison. Indeed, such a belief was inevitable, until modern chemistry showed its fallacy.

"Canis. It has been affirmed that the brain of a dog, if eaten, mitigates and allays a mania." Though James cannot comprehend what specific virtue dog brain can have, he does not dare flatly to contradict what the authors claim for it, but thinks it may act merely as a deobstruent.

"Capon or castrated cock." James asks, after a discussion as to whether gouty people should eat it, why should a capon which is a eunuch, and free from venereal inclinations, be subject to gout? (This was commonly given as the reason gouty people should not eat it.) He quotes Hippocrates as saying: "... eunuchs are not afflicted with gout." He leaves to be determined by experience the ancient belief: "Beans macerated in Capons Blood before they are sown are, by that means, rendered proof against the injuries of herbs that have an antipathy to them."

Speaking of brain as a food James says, "There is a fat and unctuous Humidity in Brain, which gives the Stomach a great deal of Trouble to digest it." He preaches against eating it unless one has very strong viscera. He leaves to the world the decision as to whether the use of extract of brain in epilepsy is not based on superstition.

Oris. The sheep. The Brain of a Ram is said to be effectual in epidemic Diseases, and to facilitate Dentition. The Gall of a Lamb is prescribed for the Epilepsy. The Drug is refrigerating,

dazing, aperitive, and discutient: Whence it is of a very great efficacy, in the Jaundice, and other distempers. The Urine drank, expells the water in an Anasarca.

Pediculus. The Louse. Lice are taken by the Country people, as a remedy against the jaundice, and an Atrophy.

The Common Partridge. The Flesh, if eaten, augments the Quantity of Semen and Milk, and proves a stimulus to Venery . . . The Liver, dried before the Fire, and reduced to a Powder, stops an Epilepsy. The Feathers, used by way of Fumigation, and applied to the Nostrils, are beneficial in a Suffocation of the Uterus, as, also, for alleviating mitigating, and removing Colics.

Cyder. The Juice of Apples, made spiritous by fermentation. Cyder is pectoral; fortifies the Heart and Stomach; and is looked upon to be good for scorbutic and melancholy Persons.

Porcus. The tame Swine, or Hog. The excrements are of an emollient and discutient Quality, and for that Reason beneficial in Itchings, Exanthematous Eruptions; corns of the Feet, and other hard Tubercles; the Excrements of this animal, also, cure the Bites of Venomous Animals, and stop Haemorrhages of the Nose. Scurvy, a Distemper to which the Northern Nations are extremely subject, may be excited by the habitual eating of Swines Flesh, especially when hardened with Salt and Smoke." Abhorrent to us as the idea of eating feces is, may it not, as well as urine, contain, in certain diseases, excreted antidotes formed in the body?

Smelt is more delicious [than the Gudgeon] by reason of the Violet taste it has, which probably arises from the Principles of the Smelts being a little more exalted than those of the Gudgeon, and more free from gross matters.

Phoca. The Sea Calf. Shoes made of the skin are said to be a preservation against gout. The fins, especially those of the right side, applied to the head, are said to promote sleep.

Is this an example of mental therapy?

Let us now glance hastily through the volumes and extract parts that throw light on prescientific medicine. There is, of course, much error, but the errors are not caused by faulty observation but by errors in method of reasoning. Indeed men of the olden time were very acute and close observers. They, even as we sometimes do, sought for proofs to verify dogma, instead of being skeptical of the dogmas themselves.

James quotes Soranus (quoted by Caelius Aurelianus) as "reflecting upon Asclepiades, who professed to cure phrenetic patients by singing, as possessed of a strange conceited opinion." The newest opinion, held by a certain school of mental therapists of today, is therefore old, and no truer now than then.

He finds it necessary, some men still doubting, to write a long paper to prove that no man can be a physician unless he studies anatomy carefully, and uses a quaint figure, saying: "As the student of politics must know geography, so must the physician know anatomy."

His four causes of death are interesting:

There must be either an Inflammation of the more noble Parts, such as the Meninges, Lungs, Stomach, or Intestines, or extravasated Blood or Serum, as usually happens in the Brain, Thorax, and Abdomen, or some of the Viscera must be corrupted; or a Polypus must be formed among the Vessels of the Heart or Lungs, obstructing the free Circulation of the Blood.

He was convinced of the importance of the discovery of the circulation of the blood, as indeed were all men of his time. He says: "He must

be blind who does not perceive the Clouds of Darkness that have been dispelled, and the glorious Light that has been shed upon Physic, by this celestial Discovery."

Under amaurosis he records the following case of brain tumor: A man twenty-four years old, pain in the head. Fever (apparently only for a time). Vision in the left eye darkened, and later in right; soon total blindness. Later convulsions, and still later cough, hectic fever, spitting of purulent matter, and finally death from phthisis. The body being opened revealed the defect in his lungs, and in the brain a globus tumor, pressing on the origin of the optic nerves. The tumor caused the blindness, "by intercepting the Passage of the Animal Spirits to the Eye." From the context, he seems to have recognized, during life, that the patient had a brain lesion. As to its location and nature he could not have known.

"Amor. Love. It is no Wonder that Love has been esteemed a Distemper, as it is productive of many Disorders, especially Madness, as Caelius Aurelianus observes very judiciously; for Madness is more likely than Love to fix the Attention upon one Object." He quotes a Latin author at length on the signs of love-sickness, and his advice to start a law suit against the love-sick person to divert him. He states that Dr. James Ferrard published "A Treatise of Love, as a Distemper." Printed at Oxford, 1640.

Aisthetarium. The common Sensory, or, if I may so call it, the Laboratory of Sensation; this is the Place whither the Nerves convey the Impressions made on them by sensible Objects. Many have been the Opinions of Authors, with Respect to this Place. The Cartesians imagine it to be the Pineal Gland. Willis endeavours

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to prove it the beginning of the Medulla Oblongata, in the Corpora Striata. Till the Union of the Soul with the Body is better known, it will be a difficult Matter to determine the Place where sensation is performed.

We moderns have pretty well abolished the soul, as a matter for scientific study, in discovering the sensory centers.

"Albadara. Signifies in Arabic the Sesamoid Bone of the first joint of the great Toe, which is about the size of a small Pea." I confess I had forgotten there is such a bone but, according to Piersol, it is present in 50 per cent of toes. James states further, that there is something remarkable about this bone, and relates the case of a woman he had heard about who had fits of some kind, and a physician who believed they were due to a dislocation of this bone amputated the great toe and cured her. He himself saw a case: A man stubbed his toe, and, very soon after, fits began (he had had some before). The fits resembled epilepsy, except that he did not froth. He was fifty-years old. James could not examine the toe, because the slightest attempt to do so frightened the man. James heard of his death one week after the onset, too late to make an autopsy. He says Hippocrates attributed such fits, quite properly, I suspect, to hysterics.

"Alcohol." (a long article). "As vinous Liquors have Effects upon animal Bodies, nearly allied to those of the Gas Sylvestre, or, incoercible spirit which flies off from fermenting Liquors, it seems near a Certainty, that fermented Liquors inebriate, and produce all their deleterious Effects by a portion of this Gas Sylvestre residing in them."

"Eczema." From the Greek word

"to boil." "A Pustuli which is hot and painful." Today many pages in the textbooks on dermatology are required to discuss this subject; James dismisses it in one sentence. Thus knowledge grows, even though therapeutic wisdom may linger.

"Enaeorema. The pendulous substance which floats in the Middle of the Urine." He quote Hippocrates and Galen at length as to the different import of this, according to color, position, etc. The whole article on urine shows how closely early doctors observed, even when their conclusions seem to us almost childishy erroneous.

"Epilepsia." He describes the fit as drawing its Origin from a spasmodic stricture of the Membranes surrounding the Brain, the Spinal Marrow and the Nerves; by which means the subtle nervous Fluid is copiously and impetuously conveyed in the Organs of Motion, but in a Smaller Quantity, and with less Impetuosity, into those subservient to the Purposes of Sensation.

"Chorea Sancti Viti. St. Vitus Dance." He relates the legend of the dancing women. Recognizes it was a different thing from Chorea, quotes Sydenham's excellent description, and then advises this treatment: "Bleed seven ounces from the arm, or such a quantity as best suits the age of the patient." Next day he gives his usual lenitive purge of tamarinds, rhubarb, senna, and syrup of roses. Next evening he gives the following "Paregoric, Black-Cherry-water, an ounce; compound Piony-water, three drams; Venice Treacle, a scruple liquid Laudanum, eight drops. Mix and take." Paregoric in his day meant a sedative, not the specific medicine we now so name. He again bleeds and purges. He gives several other mixtures. He knew the tendency to

recurrence, and advised bleeding as a preventive measure.

"Decubitus. The Manner of Lying." James describes the information we obtain by the way the patient lies, activity of movement and the like, and the significance of movements in fever. He describes, as follows, the decubitus which signifies that death is very near. "The soul controls all movements, hence the soul having lost its Power, the body lies like a dead weight on the Back, with the arms and legs projected, rolling down insensibly towards the feet, and the head either falling back, towards the hinder parts with the chin and throat erected, or in a nodding position resting on the clavicles." This article could be read by many of us with advantage, because it describes many important things we overlook.

"Diabetes." From the Greek "to pass off." He quotes a Dr. Lister as saying he had never met with a urine (in diabetes) of sweet taste. Later James says "The Urine of those afflicted with diabetes is generally sweet." Sugar he does not mention, and its discovery in urine came years later. I suppose Lister had only seen diabetes insipidus.

"Dorsum. The Back." James, under Gibbosity, describes the condition carefully studied by Pott years later, but does not speak of tuberculosis as a cause. He notes its greater frequency in children, and describes a "stay" made of iron, thick paper, or whale bone which often cures it.

"Calenture. A sort of fever, attended with a sudden Delirium, which is common to sailors in warm climates, especially on passing the Line." James quotes the following case

from Dr. Oliver: A sailor, thirty years old, on a man-of-war, in the Bay of Biscay, became suddenly violent and needed four men to prevent his jumping over-board. He looked as furious as a lion. He cursed those who held him. He cried out continually he would go to the green fields. There was burning heat all over his body. "There was a disorderly motion of the blood in the artery on taking the pulse but I could distinguish no distinction or vibration of pulse." Oliver bled him from three places, the arm, the frontal, and the jugular. The blood was thick but finally he got in all 50 oz. The patient became quieter, slept, and awoke well, save for weakness and muscle soreness. Oliver says this illness, most prone to come on suddenly at night, explains some of the disappearances of sailors from ships. James says he never saw a case, and is of opinion that it is merely sudden fever with delirium.

"Capivard." The word is not in the New Oxford or the first edition of Johnson's Dictionary, and when we read about it we are inclined to believe James must have listened to traveller's tales. "In Portuguese it signifies a water dog, which is described to be an amphibious animal, with a body like a boy, and head like a hare, and without a tail. It keeps itself almost continually on its posteriors, like an ape. It is found in Brazil. It lives all day in the sea, and at night comes on shore to ravage the gardens, and root up the trees. Its flesh is wholesome food."

"Chemia. I shall always make use of Chymistry as a word already received in the English Language; though some, either out of an affectation of singularity, or too servile

complaisance to the celebrated Boerhaave, or to the French, have lately call'd it Chemistry or Chemy; the last of which particularly appears to be a very trifling and idle Innovation."

How far away and long ago the book seems, when under the heading "Cochineal" we are told, "Authors are not agreed as to whether it is the grain of a West Indian tree or some kind of worm."

"Cerebrum. The brain." The article is long. He credits Malpighi with "the first and best instruction for examining the structure of the brain, especially of the two substances (gray and white) of which it is made up" and for "putting us in a condition to be able to conjecture something about its uses. The brain is a secretory Organ, or, as it is called by Anatomists, a Gland." He goes on to define gland as an organ fitted to separate some particular fluid from the mass of blood.

The whole Matter of Secretion must be owned to be very obscure; but it is to be hoped, that the Brain and Liver will some time or other lead us so far into the Knowledge of it, as, at least, to be able to distinguish Truth from Falsehood. This subtle Fluid, commonly called Animal Spirits, Nervous juice, or Liquor of the Nerves, is continually forced into the Medullary fibres of the white Portion of the Cerebrum, cerebellum, Medulla Oblongata, and Medulla Spinalis, and, by the Intervention of these Fibres, supplies and fills the Nerves, which are a continuation of them.

He first explains that secretion occurs in the gray matter and quotes from a paper written by Steno in 1668 querying about Animal Spirits; "Are they Blood or a particular substance separated from the Chyle by the

Glands of the Mesentery? Or may they not be derived from a lymphatic serum? Some compare them to spirits of Wine, and it may be doubted whether they are not the Matter of Light." He quotes Steno, also, as to brain function: "The Antients were so far prepossessed about the Ventricles, as to take the Anterior for the Seat of Common Sensation, the Posterior for the seat of Memory, that the judgment, which they said was lodged in the Middle, might more easily reflect on the ideas, which came from either Ventricle." Steno asks the believers in the doctrine to give him some reasons for their belief. Steno quotes Willis as maintaining, indeed being the author of, "a very singular Hypothesis, that common sensation is lodged in the Corpora striata, the Imagination in the Corpus Callosum, and the memory in the cortical Substance." Steno has great respect for the genius of Descartes, even though Descartes' imaginary machine and that of the human body may differ vastly. He seems not to agree with him as to the pineal gland. Steno explains how difficult it is to dissect and study the anatomy of the brain and pleads for more and careful study. He stresses that we should study the brains of animals, and also animal and human postures. How ancient and yet how modern it all is. He also realized how necessary it is to know comparative cerebral anatomy, and yet, where explaining mental function, he is content with mere words, having no strictly limited meaning. We modern psychiatrists are sometimes similarly satisfied.

"Nux Vomica." He gives no therapeutic use of it, and describes it as "narcotic, virulent, and even worse

than Opium." He quotes Dr. Hulse as reporting death in convulsions in a dog and a cat which ate the nuts, and speaks of country people destroying noxious birds by throwing bits of flesh powdered with *nux vomica* where they feed.

"Oedema." He gives no indication that it is caused by heart or kidney disease, and defines it, as a tumor in general. But it signifies particularly a phlegmatic, cold and soft tumor, retaining the print of the finger, but attended with little or no pain. He realized that it stood in relation to the circulation, or rather, as he states it, to "too great Serosity or Viscidity of the Blood."

"Oesophagus." Under "spasm of the," he says:

In the suffocative Paroxysms of hysteric Women, where the Patients lie half dead, in order to rouse them, besides Clysters, volatile fetid, Nerve substances, and Preparations of Castor, are useful, when applied to the Nostrils, as, also the Feathers of Partridges, and other fetid substances kindled; for these are of singular efficiency in soothing irregular motions.

Alas! Notwithstanding all our progress, we see many believers in superstitions quite as crude as:

Omphalomantia. A Sort of Conjur-ation, a Divination, practiced by Midwives, and old Women; which consists in foretelling how many more Children a Woman shall have, by observing how many knots there are on the Umbilical Cord of one Child.

Opiata. The Antients justly called those Medicines Opiates, in whose Composition there was Opium, or any other Ingredients, of a Narcotic Quality; but, at present, the Name of Opiates is unjustly and abusively bestowed upon

the Medicines prepared with Opium, whether of the corroborative, alterative, or purgative Kind, only on account of their consistence, which resembles that of the Theriaca and other Opiates of a like nature:

The use of the word "abusively" is interesting.

Orvietanum. The Name of a celebrated Antidote, thus call'd, according to Lemery, from Orvieto, a City of Italy, where it was first used; but, according to others, from Hieronymus Ferrantes Orvietanus, a celebrated Mountebank, who invented it.

The Antidotum Orvientum is thus prepared. Take of old Theriaca, and dry'd Vipers, with their Hearts and Livers, each four Ounces; of the Roots of Vipers-grass, Carline-thistle, Masterwort, Angelica, Bistort, the Smaller Birthwort, Contrayerva, white Dittany, Galangals, Gentian, Costus, and true Acorus, of the Seeds of Macedonian Parsley, of the Leaves of Sage, Rosemary, Goats-rue, Carduus Benedictus, and Dittany of Crete, of Bay and Juniper-berries, each one Ounce; of Cinnamon, Cloves, and Mace, each half an ounce; and of the best Honey despumated, eight Pounds: Make into an Antidote.

Reduce all the Ingredients into a common Powder; despumate the Honey, and boil it to the Consistence of a thick Syrup. Suffer it to become half-cold, and then, by means of a Spatula, carefully mix with it the Theriaca, and the Powder, in order to make an Electuary, to be kept, for Use, in a close-stopt Vessel.

This electuary, or Antidote, is highly esteem'd, as good against the Plague, the Small-pox, and the Bites of poisonous Animals. It, also, corroborates the Brain, the Heart, and the Stomach. The Dose is from one Scruple, to a dram and an half.

"Osciatio. Yawning." After describing the act, he continues:

I cannot here omit the vast advantage of some little Exercises just after waking in the Morning . . . This can be affected no surer way that I know of, than by the Flesh-brush, which ought to be used just before rising, and putting on any cloaths; and if now-and-then the Person would leap about and stretch his arms with weights in each hand, it would wonderfully promote the good ends which are to be produced hereby.

"Paralysis." Under this he refers to workers "in Lead Mines, who after a violent Colic, accompanied with obstinate costiveness, induced by unfriendly Steams, fall into a Palsy of the Arms." He also quotes "a Palsy, succeeding a Colic, produced by drinking wine edulcorated," (i.e. sweetened) "by Litharge."

"Parorasis. An Imbecillity of Sight." The word imbecility has a very curious and interesting history, too long to detail here.

Pectinatio. Combing the Head. This is recommended by some as an exercise conducive to Health, and considered as a Species of Friction; it is certainly very useful not to mention that, by cleaning the Head from Scurf and Dirt, it prevents Obstruction of the cutaneous Pores.

Pentapharmacum. A Medicine consisting of five Ingredients. Also the name of a favorite Aliment of the Emperor Adrian, as Aelius Spartianus informs us, which consisted of the udder of a Cow, a Peacock, Ham, a sort of Paste or Cake, and Bran.

Pertussis. Usually applied to Chin-cough. The Spasmodic Disposition of the moving Parts seems, as in other convulsive Disorders, to proceed from an heterogeneous and elastic Matter convey'd along with the nervous Fluid from the Brain through the Nerves into the moving fibres of the Breast. For this reason, when the Spirits, lodged in these Fibres, are

excited to the violent Motions of Expiration, they fall into convulsive Motions.

He says a sudden cure issometimes brought about by a great fright, e.g. putting the child in the hopper of a mill where the great noise and the many moving wheels scare it. He explains the cure as follows:

The Animal Spirits, being by the Fright, forced into new distractions, leave their former inordinate motions. Also the matter producing the Spasm is, by such a perturbation forced into other nerves, where it proves less troublesome.

Phlebotomy. There is not a more excellent, instantaneous, and efficacious Remedy for removing various Diseases, both of the acute and chronical Kind, than Venesection, prudently and cautiously used. Coagulations and concretions of the Blood, firmly imbedded in the large vessels of the Heart and Lungs . . . which, by intercepting and obstructing the free circulation of the Blood, destroy life. They are found in Pleurisy, Peripneumonia, Asthma, Whooping Cough, Phthisis.

All through the article, he confuses cause and consequence. He claims anger, fright and sorrow may cause polypi. He says:

The preposterous methods of curing violent Haemorrhages, and intermittent fevers, by astringents, Opiates, Chalybeates, and even the Peruvian Bark, greatly contribute to bring on violent chronical, and even incurable Disorders; which are produced and supported by Polypose concretions.

Plica Polonica. In Poland and Lithuania this disorder is endemial, and well known. It consists in a preternatural Bulk of the Hairs, which, being firmly conglutinated and wrapped up in inextricable Knots, afford a very monstrous and unseemly Spectacle. When these are cut, the Blood is discharged from them

the Head racked with Pain, the Sight impaired and the Patient's Life frequently endangered.

He realized that dirtiness of the head is a cause, but also believed that there was something in the water of Poland. He relates a story of two soldiers, who, when washing in a pond, found their hairs contracted into many folds.

Lunaticus. A Lunatic is properly a Person labouring under any Distemper, which increases or diminishes, or seizes and goes off again, at different times of the Moon. It generally signifies a mad Person, whose Disorder is in this manner, governed by the Moon.

"Chancre." He does not differentiate syphilis from gonorrhoea. John Hunter, by the way, also believed they were one disease. James writes, "Now as Chancres are occasioned by the sharp Matter of a Gonorrhoea, which sticks to the Glans or Foreskin, the softest parts take the Injection most easily, and the corrosion will be the strongest when the Quantity is greatest."

"Pyretos. A Fever. A Fever is a very frequent disorder, unseparably attended with an Inflammation, the Cause not only of many Diseases and Death, but, also, frequently of a happy and successful Cure." The great symptoms are "Horripilation, a quick Pulse, and Heat." What we call a chill he describes as "febrile tremor." He advises much liquid, in small quantities, and "gargarizing [gargling] the mouth." External heat may be

determined by a Thermometer; internal by the sensations of the Patient, and redness of the urine.

"Alcahest. An arbitrary Word, derived from no Language, and coined by Paracelsus, to Express an universal Menstruum, or Solvent, as Helmont explains it." He writes a long and wisely sceptical article about the word and the thing.

"Psychli. A People of Africa, celebrated by the Antients, for curing the Wounds of venomous Bites by sucking them." But he quotes Celsus as saying that anyone may do the same thing, without any injury to himself.

The conclusion of the whole study is: James was a man living just before the new birth of medicine, having a glimmering of the future, not having vision to see the dawn as well as some others, some even born many years before him, bound in intellectual chains, but still a student. There has been a greater and more revolutionary change in the philosophy of medicine in the last hundred years than in all previous time, but there has been no sudden break. There has been an evolution of knowledge, just as there has been an evolution in the anatomic forms of plants and animals, a process which probably will never cease, and just as there are vestigial organs still in the human body, so there are vestigial opinions existing today. Sometimes they are harmless, and sometimes they strangle reason and keep superstition alive, indeed are themselves superstitions.

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GABRIEL HONORÉ DE RIQUETTI,
COUNT OF MIRABEAU
A MEDICO-HISTORICAL STUDY

By ROBERT A. MOORE, M.D.

COLUMBUS, OHIO

PROBABLY no place in history furnishes so abundant a mass of facts for the historian to study cause and effect as the period preceding the French Revolution of 1789. It furnishes a background for Carlyle's History of the French Revolution, in which the author has gained the height of historical writing.

In the study of the history of medicine there are many lines of inquiry. We may study the writings of the great physicians and surgeons or we may study the writings of contemporary literary men. Either one is only a part of the story. Our knowledge of Roman medicine would certainly be incomplete from studying only the writings of Galen. The writings of Pliny and the other great lay Romans give us an insight to the reactions of the masses to medicine and surgery, the position of the physician in the economic framework of the nation. How many of us in speaking of Galen realize that in addition to transmitting to posterity an entire system of medicine, he wrote a learned treatise on philosophy and mathematics? The "De Contagione" forms a small part of the life labors of Fracastorius, which included a system of astronomy and optics. Our knowledge of the Alexandrian school of anatomy would be incomplete without a study of the munificent policy of the Ptolomies. Men are only products of their times and herein lies the true underlying

principle of all history, a study of the workings of the human mind at that time. The great eras of medicine so ably discussed by Dana are only reflections of the general thought of the time. Few men create eras. Why do we fill our medical journals with discussions of the infectious nature of cancer, arteriosclerosis and nephritis? Because we are living in the era of the infectious nature of disease created by Pasteur.

So, even in the relatively recent times of the eighteenth century, the study of medical quackery not only serves as an interesting study in itself but undoubtedly cultism and its position in the hearts of the people gives us an opportunity to psycho-analyze the French mind of 1780. Does not the recognition of Cagliostro and Mesmer and their myrmidons reflect the general credulity of the human mind and give us an insight to the subsequent reaction of the Parisian mobs to the demigods? Political revolution does not occur in a few years but the mind of men must be receptive. As Durant has recently written: "After all when one tries to change institutions without changing the nature of men, that unchanged nature will soon resurrect those institutions." A great many of these charlatans who preyed on the credulity of the people were banded together in a society called the "Illuminate" of which Cagliostro was the leading exponent. His gift of lying carried

him to the height of society and financial reward. Among other things he claimed to have discovered the art of living forever, to have been a friend of Abraham, to have been present at the wedding at Cana, and to be able to make diamonds from nothing. His cures were regarded as miracles and it is said that the cardinal de Rohan, the one of the necklace, erected to him a marble bust with the inscription, "God of the Earth." The whole situation is admirably summarized by Carlyle:

Or observe Herr Doctor Mesmer, in his spacious Magnetic Halls. Long-stoed he walks, reverend, glancing upward, as in rapt commerce; an antique Egyptian Hierophant in this new age. Soft music flits; breaking fitfully the sacred stillness. Round their Magnetic Mystery, which to the eye is mere tubs of water—sit breathless, rod in hand, the circles of Beauty and Fashion, each circle a living circular Passion-flower; expecting the magnetic afflatus, and new manufactured Heaven-on-Earth. O women, O men, great is your infidel faith! A Parliamentary Duport, a Bergasse, D'Espremenil we notice there; chemist Berthollet too—on the part of Monseigneur de Chartres.

Had not the Academy of Sciences, with its Baillys, Franklins, Lavoisiers, interfered! But it did interfere. Mesmer may pocket his hard money, and withdraw. Let him walk silent by the shore of the Bodensee, by the ancient town of Constance; meditating on much. For so, under the strangest new vesture, the old great truth (since no vesture can hide it) begins again to be revealed: That man is what we call a miraculous creature, with miraculous power over men; and, on the whole, with such a Life in him, and such a world around him, as Victorious Analysis, with her Physiologies, Nervous-Systems, Physic and Metaphysic, will

never completely name, to say nothing of explaining. Wherein also the Quack shall, in all ages, come in for his share.

In further inquiry into the position of medicine in the general life of eighteenth century France we find that in Toulouse a Protestant could not become a lawyer, doctor or apothecary, and in one case where a woman employed a Protestant midwife she was fined 3000 francs. Although this borders on religious questions it also tells us that the science of healing occupied a position which did not brook interference from persons of inferior status in the state's system of caste. This is in striking contrast to the position of the doctor in Rome, so ably discussed by Allbutt.

In the story of the Revolution one has available for study psychology of the individual and the mob in its best form. What of the great dramatic moments during the stormy days of the constitutional convention when one man by personality and oratory could sway the convention to inhibit or accelerate the oncoming surge of republicanism? On June 23, 1789, King Louis XVI entered the joint meeting of the three estates. He concluded his somewhat indefinite address by: "I command you, gentlemen, to disperse immediately, and to repair tomorrow morning to your respective chambers, there to resume your sitting." As the King left, the nobility and clergy followed, but the third estate remained. Here was the crisis of the revolution, a word one way or the other from a man of power could destroy or remake the monarchy. Mirabeau was the man. Rising to his feet like a giant, he elevated his voice: "Gentlemen, I confess that what you have heard,

might be beneficial to the country, were it not that the presents of despotism are always dangerous . . . I call upon you, gentlemen, to assert your dignity and legislative power, and to remember your oath; which will not permit you to disperse till you have established the constitution." When remonstrated with by the Marquis de Brézé, Mirabeau replied: ". . . Go and tell those who sent you, that we are here by the will of the people, and that we will only be driven hence by the power of the bayonet." The damage was done, the wheels of revolution had started rolling.

What of this man Mirabeau, a man who by his personal power on June 23 started arranging the scenery which was to serve as the stage setting for some of the darkest days in the history of France, the Reign of Terror, and who in the last months of his life attempted to stem the tide of revolution. The man who after a midnight conference with Marie Antoinette said: "The monarchy is saved." It is our intention to inquire into the illness and death which prevented the consummation of this statement.

Leaving for the moment, the moot questions of Mirabeau's private life and its possible effect on his last illness, let us proceed immediately to the facts in the case. We have available not only a very complete case history but also an autopsy protocol written by the one best prepared to write such a record, his private physician, Cabanis. The autopsy record reads:

The stomach, duodenum, a great part of the liver, the right kidney, diaphragm and the pericardium, presented traces of inflammation, or rather, active congestion. The pericardium contained a con-

siderable quantity of thick, yellowish, opaque matter. The whole of the external surface of the heart was covered with coagulated lymph, with the exception of its apex. The cavity of the chest contained a small quantity of water.

From this rather sketchy description one concludes that Mirabeau was suffering from an acute sero-fibrinous pericarditis. Passing back into a discussion of the case history we find that for several years he had suffered from attacks of fever and blindness. In 1791 he had added to these the symptoms of rheumatism, internal pains and temporary swelling of the limbs. Leeches and bandages were used to control the swelling and general plethoric habitus.

On March 25, 1791, he suffered, while on a trip to the country, an excruciating attack of colic. Despite this attack he proceeded to the assembly on the twenty-eighth to deliver an address. On the way he became so exhausted that it was necessary for him to lie down to recover. On leaving the assembly he was still weak, but recuperated somewhat after a bath and attended the Italian opera that same evening. But after a few minutes at the opera he was again seized with an attack of pain which practically prostrated him.

Cabanis writes:

After inconceivable efforts he arrived, at last, at home in a most frightful state. I found him nearly suffocating, breathing with great difficulty, the face swollen from the stoppage of blood in the lungs, the pulse intermittent and convulsive, the extremities cold and himself making vain efforts to repress the cries his agony drew from him. Never, at the first sight, had any invalid appeared to me so decidedly death stricken. My emotion, which was extreme, and which it was impossible for

me to disguise, made him perceive too well what I thought of his state.

Mirabeau's own feeling on the significance of this pain is attested by his statement to Cabanis: "My friend, I feel very distinctly that it is impossible for me to live many hours in these painful anxieties; hasten, therefore; they cannot long continue."

He suffered another attack on the morning of the thirtieth of the most violent pain, from which he had already been suffering for two or three hours before Cabanis arrived. Again he recovered somewhat but the pain continued. On the afternoon of April 1, he experienced a sudden attack of loss of speech and shortly afterwards another agonizing seizure of pain and dyspnea during which he died.

What is our evaluation of this case history? Here is a man, forty-two years of age, who suffered for several years from attacks of blindness, fever and swelling of the limbs; who, during the last week of life, experienced several repeated attacks of epigastric and precordial pain, each lasting for hours, associated with dyspnea, irregular pulse, shock, and a sense of impending death; finally dying in such an attack. On autopsy, an acute serofibrinous pericarditis was found. What other pathological processes were present, obscured perhaps by the attempt of the prosecutors, as claimed by some, to cover the evidence of poisoning it is impossible to say. Yet with this evidence, the diagnosis seems fairly apparent, namely, a cardiovascular renal complex with terminal coronary occlusion and cardiac infarction. The premonitory signs of 1789 and 1790 conform in their main points with the signs of chronic nephritis and a failing heart muscle. The terminal illness certainly follows closely the

history of a case of cardiac infarction with its ever present coronary sclerosis. Pericarditis is a frequent complication of cardiac infarction. Thus if we were to write the anatomic diagnosis it would be about as follows: Cardiac infarction, coronary thrombosis, coronary sclerosis, hypertrophy and dilatation of the heart, chronic nephritis, general arteriosclerosis.

Having expressed the opinion that Mirabeau died of coronary occlusion and cardiac infarction, let us proceed to examine the evidence upon which some have concluded that he was poisoned. First, we must acknowledge that Mirabeau's presence in the Assembly was not pleasant to the radical block and that poisoning was not an uncommon means of removing an objectionable person in eighteenth century France. The autopsy from which we have previously drawn material was done on the order of the public accuser of the first arrondissement of Paris:

The violence of the illness, its rapid progress, the suddenness of the dissolution; perhaps also the exaggerated fears that the celebrity of M. Riquetti, the services which he has rendered to the public cause, and the strangeness of the circumstances, seem to justify, to a certain extent, the supposition that the death of M. Riquetti could not be natural. To verify that idea, or destroy suppositions perchance illfounded, it is necessary to proceed to open and examine the body; and to give all publicity and authenticity possible to that examination.

Clearly the entire case is based on the notoriety of the man, his sudden death and possibly a desire to secure evidence against the enemies of the people's friend.

During the autopsy it is said that M. Roudel, a student of Professor

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Sue, on opening the stomach found many erosions in the mucosa and exclaimed that Mirabeau had been poisoned. Professor Sue immediately silenced him with: "He was not poisoned—he cannot be poisoned—understand that, *imprudent!* Would you have them devour the King, the Queen, the Assembly, and all of us?" Barbier, who subsequently became a noted practitioner, examined the stomach and concluded that it had become eroded by a mineral poison.

With this autopsy evidence some have gathered together other points which are purely circumstantial. Through an unknown woman Mirabeau was informed of an assassination plot. In November, 1790, he passed a cup of coffee intended for him to Pellenc, who on drinking it experienced severe internal pains. After dining at strange houses he was frequently seized with epigastric pains. Because of his notoriety he was the recipient of many gifts of wine and other foods. What is this evidence worth? Absolutely nothing! It sounds very similar to the evidence in the trial against Marie Antoinette. Here, if we analyze the proceedings most severely we find that the "Tribunal criminal revolutionnaire" under the presidency of Herrmann introduced not one bit of absolute evidence but only opinions. Take the evidence of Labenette: "I perfectly agree with a great number of the facts alleged in the acte d'accusation! I say, moreover, that three people came to assassinate me in the name of the accused!" Or again the testimony of Tard: "I declare by common report, that what is written in the acte d'accusation is true." All very inclusive statements, but of no value in determining the guilt of the poisoner accused of

plotting against the leaders of the people's cause. With the case against the enemies of Mirabeau our conclusion must be the same, very interesting information but of no value in arriving at an opinion. The only fact that need bother us in the least is the finding of mucosal ulcerations in the stomach at autopsy. Perhaps these were gastric ulcers, yet the repeated attacks of severe pain could not have been the result of them unless there had been perforation, and apparently there was no perforation and peritonitis. Again any poison capable of producing gastric ulceration certainly would not require a week to kill, nor would it be ingested without some suspicion. Finally, we must conclude that although there is no absolute evidence against death by poisoning, it seems more probable that the poison verdict is a result of the general fear of all great men of this death. This position is strengthened by a series of premonitory signs, final illness and autopsy findings which are closely correlated.

Another point in the medical analysis of this giant of the First National Assembly of France is deserving of consideration. Because of his known and undisputable immorality he has been accused in lay language of suffering from satyriasis. Perhaps this is true, but in general, there have been of late too many accusations that this or that person in history suffered from syphilis, nymphomania, etc. In evaluating these indictments we should always follow the maxim "Make haste slowly" and have indisputable evidence at hand. Perhaps if Mirabeau had not eloped with Sophie his immorality would not have come to the notice of posterity, since in his other private affairs he did not exceed

the moral standards of his time. It seems rather insecure to convict a man of a sexual psychosis on the basis of his immorality in an age when all morals were lax.

Turning now to the man, what did the world miss by this untimely death? The position of any one individual in the onrush of the world is difficult to determine. The world may halt momentarily at the passing of its heroes, but not for long. At the death of Mirabeau the young republic certainly did hesitate. The municipality of Paris proclaimed a period of mourning for eight days. The Jacobins resolved: "That they would attend his funeral in a body; that they would wear mourning for eight days; that they would resume it every year on the 2nd of April; that his statue should be executed for them in marble." The Assembly directed that his ashes should be deposited in the new edifice of St. Genevieve, which was to be "devoted to the reception of the ashes of great men." So much from his friends. What of his enemies! On learning of his death Marat exclaimed:

People return thanks unto the gods! Thy most redoubtable enemy has just fallen before the scythe of destiny: Riquetti is no more; he has fallen the victim of his numerous treasons; victim of the barbarous foresight of his atrocious accomplices, alarmed by having seen the depository of their frightful secrets to be wavering.

And Robespierre on learning of Mirabeau uttered the striking passage: "Achilles is dead! Then Troy shall not be taken."

But after a few years what was the verdict of France? In 1794 the ashes of Mirabeau were removed from St. Genevieve and replaced by those of Marat. Honor is a transient

expression of the world and it requires many years to construct an adequate picture. Today, although we must acknowledge that Mirabeau suffered from many faults and flaws, we must also acknowledge that it was he who preserved the balance, who saw that one cannot tear down a king to the level of the masses and then remake him, saw that it was a constitutional monarchy that the people of France desired and that the Girondists were bent on the destruction of the very foundations of France.

It is perhaps useless to speculate on the possibilities if this or that great man in history had not been taken from the world during his prime. What might have been the result on the history of the United States if a tracheotomy had been performed to alleviate the laryngeal edema of George Washington? Or again would the great empire of Charles v have fallen if he had held the reins of power for a few more years instead of retiring to nurse his sclerotic vessels? Undoubtedly disease, mental and physical, in the great heroes and military leaders of the world has influenced history more than all the armies ever gathered together under one standard. Perhaps the whole subject of our discourse could not be written were it not for the death from smallpox of the Dauphin's, son and grandson of Louis xiv. Louis xvi would have been another man; there would have been no Austrian Princess for the Parisians to blame for all their troubles. Except for the mental quirk of Louis xvi in demanding to walk up the hills on the flight to the border, or his vacillating character after capture at Varennes in not allowing his supporters to force passage, the history of France

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at the opening of the nineteenth century might be entirely different. France at heart was monarchistic; crowd psychology carried her off her feet until the First Council appeared. In the case of Mirabeau we have clear evidence of his power over the constitutional convention. That he was conscious of this power Dumont has left us a record: "The evils," Mirabeau said, "that I have held back will fall upon all parts of France; that criminal faction which trembles before me will have no longer a bridle. They have sought to govern the king, instead of being governed by him; but soon neither they nor he will govern; a vile faction will rule over all and cover France with horrors." How prophetic this was. It forewarned of the events to follow; the days of Robespierre and his cohorts, an era resplendent with material for the study of the delusions of perse-

cution as applied to masses instead of individuals. The highly excitable mob led by irresponsible demigods convinced that the monarchy was persecuting them, easily slipped over into a general delusion that all persons were their enemies, and the life of all men hung in the balance of the mob's will. From the honors which were heaped upon Mirabeau after his death, there can be little doubt that he could have held the vicious spirits of the Girondists under the lash of his personality and oratory and preserved the throne of the Capets. Mirabeau's death bed statement, "I carry in my heart the dirge of the monarchy, the ruins whereof will now be the prey of the factions" was right. He carried the throne of the Capets with him but he left a place for one of the most noteworthy characters who ever passed across the horizon of history, Napoleon Bonaparte.



GARCIA DA ORTA

THE FIRST EUROPEAN WRITER ON TROPICAL MEDICINE AND A
PIONEER IN PHARMACOGNOSY

By LOUIS H. RODDIS, LT. COMDR., M.C., U.S.N., F.A.C.P.

WASHINGTON, D. C.

HISTORY presents many examples of vast colonial empires acquired and controlled by relatively small nations. Rome and Carthage disputed for the possession of the entire ancient world and in our own day the contrast between the size of the British Isles and the British Empire cannot but excite our wonder. The sixteenth century witnessed an even more striking instance of disparity between the size of the country that exercised dominion and the area she ruled. Portugal, with little more than thirty-four thousand square miles, established its authority or enjoyed commercial supremacy over parts of Asia, Africa and South America that taken together were more than two hundred times the size of the mother country.

It was in 1497 that Vasco da Gama made the first voyage from Lisbon to "Calicut" (Calcutta) on the west coast of India described by the Genoese geographer Nicholas de Canerio on a map of 1501. "This is Calicut," says the old cartographer's legend. "It is a most noble city discovered by the most renowned prince D. Manoel, King of Portugal. Here are much benzoin of fine quality, and pepper and numerous other commodities from many regions, with cinnamon, ginger, cloves, incense, sandalwood, and all sorts of spices; stones of great value, pearls of great value, and seed pearls." This was the beginning of direct sea communication with the Orient. Albuquerque,

one of the greatest soldiers and administrators of modern times, saw the necessity of having more than mere trading privileges and in 1510 seized Goa, an important city on the Malabar coast and made it the seat of the viceregal government in India. The capture of Ormuz commanding the entrance to the Persian Gulf, and Malacca near the end of the Malay Peninsula and the crossroads of commercial routes between the far and middle East, soon followed. The Moluccas or Spice Islands were occupied by an expedition in 1511 and by 1520 Portugal had gained either commercial supremacy or military control throughout the Indian Ocean and Arabian Sea, and the route around Africa had been secured by the erection of forts and trading stations wherever good harbors existed. At these places the Portuguese Indiamen could touch, provision or refit in friendly waters safe from storm or enemy.

In the stream of soldiers, sailors, administrators, merchants, clerics, civil servants, professional men, and mere adventurers of every sort that flowed toward Portugal's newly established interests in the Orient were many whose names were destined for fame. Luis da Camoens, the poet of love and the sea and the author of the great national epic; Albuquerque, the soldier and statesman; Jao da Castro, sailor and scientist; Magellan, the first circumnavigator of the globe; Mascarenhas, the heroic defender of

Diu; Mendes Pinto, the traveler; Couto, Castanheda, and Correa, the contemporary historians of the rise of the Portuguese power in the East; Francis Xavier, the saintly apostle of the Indies; all these and many less known were in the current sweeping toward the new colonies. Here too was found the subject of our sketch, who in March 1534 embarked for India, the land where he was to do the work that marks him as the possessor of one of the great scientific minds of the Renaissance.

Neither the date nor place of birth of Garcia da Orta are exactly known. The Count de Ficalho believes he was born in 1490 but no date more accurate than the closing years of the fifteenth century can be definitely stated. It is practically certain that Elvas, an important fortified town in the province of Alemtejo and less than twenty-five miles from the Spanish frontier, was his birthplace. As his family was related to that of the famous viceroy Martin Affonso da Sousa, it is likely that he was of gentle blood. His classical and medical education was begun at the ancient university of Salamanca and completed at Alcalá de Henares. The reason for his choice of the two Spanish universities rather than Coimbra, the national university of Portugal, is not clear. That the restrictions of the inquisition may have had something to do with it is possible, a supposition that is made more probable by the fact that there were a number of his fellow countrymen with him at Salamanca. However, the mere proximity of his home to the Spanish border may have been the principal reason for his choice of schools.

At Alcalá de Henares, da Orta came under the tutelage of the celebrated

lecturer in botany, Antonio de Lebrija, who was greatly interested in the flora of the recently discovered New World. His teachings had a profound influence on the young Portuguese medical student whose predilection for the "gentle science" was confirmed to such a degree by the direction given to his talents by de Lebrija that it made him a life-long student of plants and with the exception of Cesalpino, the greatest botanist of the sixteenth century.

In medicine there was a controversy between the adherents of the Arabian school that taught the tenets of Avicenna and Rhazes and a new school that demanded the teaching of Hippocrates and Galen in a pure and uncorrupted form. The struggles between these schools involved the whole medical profession and led to no small confusion to the student. There were some who distrusted both schools, the most notable skeptic being Paracelsus. Jayne says of him in this connection, "Only Paracelsus stood scornfully aloof, absorbed in his own dogmatic theories, and vowing that his shoe buckles—the shoe buckles of Phillipus Aureolus, Paracelsus Theophrastus Bombastus von Hohenheim—contained more medical knowledge than all the treatises of Galen and Avicenna put together."³

This independent thinker, one of whose numerous names has given us the words "bombast" and "bombastic," was not the only doubter. There were many others who were ready to depend less upon tradition than upon their own observations, records and conclusions and the result is seen in the new spirit of scientific inquiry that developed during the Renaissance. None showed evidence of this spirit more than did da Orta and the

original character of his thirty years study of the diseases and drugs of India is a striking example of it.

The years 1515 to 1525 were apparently spent at Salamanca and Alcalá. Just when he received his degree in medicine is unknown but it is thought to have been in 1525. Authentic documents from the archives of the Torre de Tombo indicate that he was practising medicine in a small town of the Alemtejo in 1526, that he went from there to Castello de Vide, a larger town of the same province, and in 1530 went to the University of Lisbon as professor of logic. Ficalho, the biographer of da Orta, notes with amusement that Pedro Nunes, the celebrated mathematician, was a professor of metaphysics, and da Orta, the physician and botanist, a professor of logic.¹ It is pretty certain that neither one of the professors concerned themselves to any great extent with the subject in which they held the chair. In any event da Orta did not long remain at Lisbon for reasons that are soon apparent.

The maritime discoveries and the task of erecting the great transmarine empires in the New World and the Orient produced an effect on the European mind comparable only to the tremendous influence of the scientific discoveries of the nineteenth century upon the thought of our own day. The wonders and riches of the Americas and the Far East and the unfolding of the tropics made a strong impression upon European life and manifested itself in many forms in the poetry, sculpture, music, architecture, literature, science, commerce and the military and naval arts of the sixteenth century. The Manoeline architecture of the huge Convent of Jeronymos at Belem, "a tropical jungle in stone" as

it has been called, is an example. Here the exotic fruits and flowers of the tropics, the bamboo jungle, the parrots and elephants carved in marble testified to the effects of the East upon the imagination of the age. The commodities of the new commerce were even of a romantic character; spices and drugs, the pepper, ginger, cloves, cinnamon, cardamom, opium and camphor. With these were perfumes and perfumed waters, beautiful fabrics of cotton, muslin, silk and satin, rare porcelains, jewelry, ornaments and utensils of lacquer, metal and ivory. Albuquerque, when viceroy, sent as presents to the king the following list that carries with it the air of the Arabian Nights: An elephant, a rhinoceros, specimens of coinage from the mint at Malacca, two Abyssinians captured on a pilgrimage to Jerusalem with an Arab interpreter, a ruby from the Red Sea, very large and fine, a Goanese gunsmith expert in the making of beautiful matchlocks, a Mussulman from Aden learned in the growing and compounding of opium.

Another list is that sent to Pope Leo x by the King of Portugal. There were gold and jewels, a panther trained to hunt game like a dog and a Persian keeper for him, and an elephant. The latter had been taught to kneel in the presence of His Holiness and was a prized possession, as will be seen by this quaint contemporary account:³

You have doubtless heard how the Pope had a mighty beast which was called Elephant: and it held him in great honour and he dearly loved it. Now therefore you should know that the animal is dead . . . Tis dead, and His Holiness is very sorry: and they say he would give a thousand ducats for the Elephant because it was a marvellous beast, having a long snout in

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great abundance: and when it saw the Pope it fell on its knees before him and said with a terrible voice, Bar! Bar! Bar!

It may be said also that the death of "The Elephant" took place despite the efforts of the papal physicians whose treatment included a purge costing 500 gold pieces.

For the peculiarly romantic charm exercised by India and the Far East over the minds of Europe, the Portuguese have a phrase that describes it well. They speak of the "fumes of India." The "fumes of India," says the biographer of da Orta, penetrated the scholastic retreat of the physician at the University of Lisbon and we find him leaving Portugal for the Orient.

Six months was an average time for the passage to India when da Orta made the voyage, though there were great differences in this due to season, weather, and the number of ports of call on the way. The usual stops were Sao Thiago in the Cape Verde Islands, Algoa Bay on the eastern side of the Cape of Good Hope, Sofala, Mozambique and Mombasa also on the east coast of Africa, and thence across the Indian Ocean, past the Laccadive Islands to the Malabar Coast of India. The old galleons with their castellated sterns and bluff bows made no great speed unless square before the wind. Their crews "forever with the pumps in their hands, and the Virgin Mary in their mouths," the boatswain, "with his leg always lifted for a kick" are described by Albuquerque in his letters and in many a log book or "Roteiro" of the day. They suffered terribly from scurvy, which is not surprising when the length of the voyage and the character of the provisions are taken into account. There is a story of one of the Portuguese captains who heard a seaman asking

the cook for an onion and roared out at him, desiring to know if he expected luxuries in his diet. Biscuit, bacon, cheese, dried fish, beans, peas, oil, vinegar, water and wine were the staple sea stores. It might be mentioned than when the Spanish Armada was provisioned the usual proportion of wine and water was twelve casks of wine to one cask of water, a proportion common in some of the extant victualing lists of the Portuguese Indianman.^{4,5,6}

Camoens in a famous passage from the Fifth Canto of the *Lusiads* describes scurvy attacking Vasco da Gama's crews on the first voyage to India:

A dread disease its rankling horrors shed,
And death's dire ravage through mine
army spread,
Never mine eyes such dreary sight beheld,
*Ghastly the mouths and gums enormous
swelled*
And instant, putrid like a dead man's
wound,
Poisoned with fetid streams the air around,
No sage physician's ever watchful zeal,
No skilful surgeon's gentle hand to heal
Were found: each dreary mournful hour
we gave
Some brave companion to a foreign grave.⁸

This fine poetical description portrays clearly the swelling of the gums and the fetid odor of the mouth so characteristic of the disease and dwells upon the high mortality where fresh fruits and vegetables were unobtainable to arrest its progress.

The vessel in which da Orta was embarked, the *Rainha*, was accompanied by four others, the *Santa Cruz*, the *Santo Antonio*, the *Graça* and the *S. Miguel*. This squadron arrived off Goan on the 10th of September, being exactly seven months in passage.¹

The first years of his life in India were spent at Bacaim and Diu. The

influence of his kinsman, Martin Affonso du Sousa, later a viceroy of India, was of unquestioned assistance to him and his first royal patient, an Indian rajah and a descendant of Tamerlane, was sent to him by this patron. This was the first but not the last of such patients, for during the next thirty years ameers and rajahs along the whole Malabar Coast sought his services and his fame spread from court to court. The native nabobs recovered with astonishing rapidity under da Orta's care. It was not only that he abandoned the complexities of both Galenist and Arabist for simpler therapeutics and the benefits of the healing powers of time and nature, but like all successful clinicians he possessed that magic of personality that made his patients declare him a prince of physicians and the only one they would have if it were possible to procure his attendance. The fees he received were in accord with his popularity and it is known that they made him a rich man before he had been in India many years and that he was very rich when he died.¹

Da Orta, however, appears to have thought less of fees than most. It was the Orient itself that exercised a fascination over him and it was the people, the climate and most of all the plants and productions of the country and the new diseases that absorbed his attention. He spent thirty years in travels that carried him to all the important places in India and Ceylon, and to Malacca and the Moluccas. The western coast of India, comprising the present provinces of Bombay and Mysore, was where he lived for the greater part of the time. It was then broken up into numerous minor principalities: Cananor, Calicut, Tanor, Cochim, Repelim and a number of others mentioned by the Portu-

guese writers of the day. The rulers of these little states were in commercial alliance with Goa and friendly to the Europeans the greater part of the time though they occasionally turned against them and more frequently still were in conflict with one another or with more powerful rulers in central or northern India. The predominant race was Hindu and the leading religion Buddhism though there were many Moslems, some colonies of ancient Nestorian Christians and a few Jews. The climate, productions, animals, plants and diseases of this region are as truly tropical as in any place on earth, and it was here that da Orta reveled in the studies of the land and people that later enabled him to give in his writings so clear a picture of the tropics. Here too he carried on the observations that constitute the beginnings of pharmacognosy as we now know that science. He records for example how he studied the common black pepper (*Piper nigrum*), then a rare and little known commodity. He observed the methods of its cultivation, the varieties planted, the precautions taken to protect it from insect enemies and the weather, the picking of the fruit, the manufacture of it into condiments and drugs, the grading and adulterations of these, the prices and commercial features of the trade, the Hindustani and Arabic names used.² He scrutinized in the same way manna, opium, acacia, aloes, camphor, stramonium, gamboge, sandalwood, nux vomica, cinnamon, ginger, cloves, nutmeg, cardamom, and nearly all the important drug plants and spices of the East. The importance of these studies can best be appreciated when we recall that no scientific knowledge existed in Europe regarding any of these drugs and that nux vomica, one of our most valuable

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medicinal agents, was entirely unknown.

His principal interest was in medicinal and economic plants, though he collected materials for a complete flora of Malabar. He established on the present site of Bombay a splendid botanic garden, and sent many plants and seeds from it to Portugal. It is not unlikely that the China orange was introduced into Europe from this garden. Citrus fruits were known to the ancients but the true orange was brought to Portugal about 1548 and legend has connected the names of the viceroy Don Jao da Castro and Garcia da Orta with its introduction. The exact facts regarding the bringing of the China orange to western Europe are still unknown but the circumstantial evidence is so strong that da Castro and da Orta sent the first specimen of this plant to Portugal that the credit for this horticultural achievement rests with them at present.

Asiatic cholera was an unknown and undescribed disease to European medicine at this time. The account given of it by da Orta not only brought it to the attention of the western world but was so complete and circumstantial as to constitute a classic of clinical description. He describes in the simplest and tersest terms the sudden onset, the profuse watery diarrhea, the extreme dehydration of the tissues, the tendency to circulatory failure and the short and frequently fatal course. Numerous severe epidemics of cholera occurred in India in the sixteenth century and one of these assailed Goa in 1543. At that time Don Martin da Sousa was viceroy and Garcia da Orta was the viceregal physician. The epidemic was at its height during the months of June, July and August. The viceroy ordered an autopsy done on one of those dead

of the cholera to see if anything might be discovered that could be useful in either the prevention or the treatment of the disease. Da Orta who performed this autopsy states that the stomach was contracted and congested, "the vessels resembling the branching of a boxwood tree." He describes the symptoms of the fatal case in these terms: "The pulse is very weak and of small volume, at times scarcely perceptible, the patient is cold and often a cold sweat covers the skin, with this is a clamorous thirst, the eyes are sunken, there is inability to sleep, the pallor of the face is equalled by the pallor of the extremities, the diarrhoea abates from weakness and death ensues."⁹ Another symptom noted by da Orta in cholera is the "washwoman's hands," the wrinkled appearance produced by extreme and rapid dehydration.⁹ His treatment was most rational: The application of external heat, friction of the skin with the hands, the application to the skin of warm oils, and a little counter irritation, in fact, simple supportive treatment. He also used very small quantities of opium to lessen the extreme depletion of the body by the excessive amounts of intestinal discharges.

Da Orta gives excellent case histories of dysentery with blood in the stools, of chronic and acute types, that must have been amebic and bacillary dysenteries. He mentions numerous cases of intermittent and continuous fevers, some no doubt malaria or kala azar, typhoid, tuberculosis, or other infections. An important medical contribution is that on snake bite. A pioneer in so many features of tropical medicine, he was apparently the first European to study and describe the cobra and the symptoms produced by the neurotoxic snake venoms of India.

He was one of our first physio-

therapists and observed and copied many of the methods of Hindu medicine in the treatment of contractures by massage and the use of cords and braces. An even more interesting side is shown by the use of the lodestone applied directly to the skin in the treatment of bruised muscles following contusions, fractures and similar injuries.¹ This is one of the earliest attempts at electrotherapy for there is little evidence of any writer recommending or using electricity or magnetism in therapeutics previous to the time of Galvani.

Da Orta returned to Goa in 1561 "with a fortune and a manuscript."² It was his intention to publish his observations during his long sojourn in the Orient and possibly enjoy the leisure conferred by wealth after a life full of activity. Goa as the center of Portuguese power in the East was the natural place for him to go both to publish his magnum opus and to live comfortably upon his well earned wealth. Goa at that time was a city of truly viceregal splendor and magnificence. "Golden Goa" it was called, and both St. Francis Xavier and such travelers as Linschoten have described it as one of the great cities of the Oriental World. Permission to publish any book had to be granted by the viceroy after approval by the Holy Office, for the Inquisition was firmly established and ecclesiastical influence in administrative affairs was strong. The viceroy was Don Francisco Coutinho, the Count of Redondo. Residing in Goa at the time was Luis da Camoens who after serving a long apprenticeship in the East had, like da Orta, returned to the viceregal city with a manuscript. Of wealth, however, he had none, and he had experienced exile, imprisonment, poverty, wounds, hunger and ship-

wreck. From the latter his life and his poem were all that he had saved. He was now contemplating the publication of his verse. Camoens seems to have introduced da Orta to the attention of Coutinho with whom he was on friendly terms and, it is believed, assisted in securing the copyright for three years and the license of the Holy Office. The latter is dated the 5th of November, 1562 and the book was passed by the censor the 10th of April, 1563. Its title page reads: *Coloquios dos simples e drogas he cousas medicinais da India*

Impresso em Goa, por Joannes de endem as x dias de Abril de 1563 annos.

"The Colloquies on the Drugs and Spices of India,"³ for such is a free translation of the title, was written in the form of a dialogue between the Hellenists, supporters of Hippocrates and Galen, and the Arabists, believers in Avicenna. This now archaic form was commonly used at the period for many forms of literature, particularly scientific and medical works. But if the form was conventional, the subject matter was not. Published two years after the birth of Francis Bacon, it was an excellent example of the method of scientific inquiry later formulated by him in the "Novum Organum." Close observation, experiment, and careful record of facts are found throughout the book. It gives the first scientific description by a European of tropical diseases and the accounts of tropical and medicinal plants are not to be surpassed. We have what amounts to complete monographs on many important members of our *materia medica* till then unknown, or but little known to the Western world. This minute and accurate study of such medicinal

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plants as aloes, musk, camphor, sandalwood, gamboge, opium, nuxvomica and all the spices is the very foundation of modern pharmacognosy and pharmacology. As a picture of tropical and Oriental life the work is equally interesting, as Jayne well notes: "Its range is far wider than its title suggests for although he was a specialist, Garcia da Orta was a true son of the Renaissance, with all its catholicity of interest; and his Colloquies are rich in notices of Indian creeds, manners, races and history."³ Da Orta was a man who would have delighted the heart of the late Theodore Roosevelt, for the natural bent of his genius led him to follow to the letter Mr. Roosevelt's maxim, "To look with interest at everything of interest."

The "Colloquies" passed through several editions and were soon translated into Castilian, Italian and Latin. Until 1578 it was the only book on tropical medicine available to the European student. In that year Christoval Acosta published his "Tractado de las Drogas y Medicines de las India Orientales" based partly upon da Orta though containing additional matter from his own experiences in the East. Acosta, a countryman of da Orta, was himself a distinguished surgeon, physician and botanist, and accompanied the viceroy Don Luis de Ataide to Goa and spent many years in India. He was personally acquainted with da Orta who supplied him with much valuable material. Acosta's book was illustrated with many woodcuts made from drawings by the author which in many instances were the first pictures of Asiatic plants seen in Europe. Thus Portugal can claim the first European writers on tropical medicine, for Alpino's "Medicina Egyptorum" did not

appear until 1591. The first English work, "The Care of the Sick in Remote Regions" by George Watson, was published in London in 1598. There are indications that John Woodall, the first surgeon general of the English East India Company was acquainted with this work as well as the "Colloquies." The "De Medicini Indorum" of Bontius appeared considerably later in 1642. The first part of Book iv of this work consists of "Notae am Garciam ab Orta." The importance of the Portuguese colonies in the tropics led to preeminence in tropical medicine and from the colonies in Africa another Portuguese physician, Aleixo da Abreu, produced a tract published in Lisbon in 1623 that gives the first description of the "Mal de Loanda" which was undoubtedly African trypanosomiasis. Thus Portugal began that study of tropical diseases which was continued by Dutch competitors in the East Indies and finally brought to our own day by the contributions of the great Anglo-Indian medical services, and the studies of French, German, Italian and American investigators.

It is not only priority in the field of tropical medicine that gives distinction to da Orta. He is the most important figure in materia medica and pharmacognosy from the time of Dioscorides in the first century of the Christian era to his own time. In the history of pharmacy he looms almost as large as the old Greek surgeon in Nero's army who so well deserves the title of "The Father of Pharmacy." The definitions of pharmacognosy given in our textbooks vary a good deal but in general it may be considered as "that part of materia medica dealing with the history, commerce, selection, identification, analysis, valuation, and preservation of crude

drugs of plant and animal origin." Da Orta was the first to cover this particular field and may be said to have been almost the founder of this important branch of botany and pharmacy. Even the breeding of medicinal plants with an idea of improving the content and potency of the contained drugs, a subject just beginning to engage the attention of pharmacognosists, was noted by him. This year pharmacists are celebrating the one hundredth anniversary of the birth of Frederick August Flückiger who was born in Switzerland May 15 1828 and who may properly be called the founder of modern pharmacognosy. Professor Flückiger frequently testified to the greatness of the work of da Orta and made many references to the descriptions of drugs by the illustrious Portuguese scientist. In one place he pays him this remarkable tribute:

The Colloquies are notable for both the richness of information they contain and the faithful and minute descriptions. No one has described the drug plants of India with so much care or with such accuracy, and subsequent investigators have almost invariably confirmed the statements of Garcia. The historian of Asiatic drugs must of necessity refer often to Garcia da Orta, his defects are few and may be attributed rather to the lack of modern instruments of precision than to any other cause. The Colloquies will always hold a place of highest honor in the history of pharmacognosy.¹⁰

In medical and economic botany he ranks with the "German Fathers of Botany," Brunfels, Fuchs, Cordus and Gesner, and the still greater Italian, Andrea Cesalpino. The task that men have set for themselves to catalogue the plants of the world, chart their distribution on its surface, investigate their origin, structure,

environment, physiology and cultivation, and to discover their uses in the arts of life is one that in spite of much work done is still incomplete. In this task da Orta will ever be remembered as an important worker. He was, too, one of the few great philosophic naturalists, a true observer of man in his relation to nature, worthy to be classed with such men as John Hunter and Alexander von Humboldt.

The exact time and place of Garcia da Orta's death are unknown. He apparently resided at Goa from 1561 to the time of his death and continued in his studies and practice, acting as physician both at the city jail and hospital. The famous Royal Hospital afterward administered with such success by the Jesuits was not yet founded. He had never married and his household in Goa he refers to in the "Colloquies" as typical of an old bachelor's establishment. It is believed that he had some illegitimate children. There is notice in seventeenth century documents of an official in Salsete by the name of Luis d'Orta who is believed to have been the natural son of the botanist. There is also mention of a Louisa d'Orta, the wife of Don Diogo Gramalo, and a Tristao D'Orta both of Goa that were children or grandchildren of Garcia da Orta.

Few men lived a life more full of rich and satisfying achievement or one that in true story-book fashion was rewarded with fame and fortune more suited to his deserts. He saw through a long life one of the greatest periods of human history full of notable events, and had been the friend and assistant of many of the great navigators, soldiers and administrators who established the Portuguese empire in the East. His success as a clinician and the number and character of his friendships bear witness to his per-

sonal charm. The man who held the respect, esteem and affection of the numerous native rajahs and ameeris of the Malabar Coast and of such men among his own countrymen as the great viceroys de Sousa and da Castro, the poet Camoens and the historian Couto must have had a personality that won men of every sort and degree. There is no portrait of him known to be in existence nor have we any personal description of him. We can only guess that his appearance must have been prepossessing. But though we know little of his appearance we know much of his work and are beginning to perceive that tropical medicine, materia medica, pharmacognosy

and economic botany all owe him a debt as one of their greatest figures.

March 10, 1934 will be just four hundred years from the day on which da Orta set sail for India. It would be well if this date could be commemorated in some suitable manner by societies throughout the world concerned with the study and advancement of tropical medicine, pharmacy and botany. The issue of special editions of their official publications, or of articles and editorials on da Orta, his time and his work would well fit the occasion and bring to members of the professions of medicine and pharmacy the memory of a pioneer in both fields.

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A BIOGRAPHIC SKETCH OF ARNOLD ADOLF BERTHOLD*

AN EARLY EXPERIMENTER WITH DUCTLESS GLANDS

By HOMER P. RUSH, M.D.

PORTLAND, OREGON

IN 1849 there appeared in Muel-
ler's *Archives of Anatomy and
Physiology*, Berlin, a four-page
report written by one Bert-
hold, carrying the title "Transplanta-
tion der Hoden." A summary of this
report is as follows:

On the 2nd of August, 1848, 6 young
cockerels were operated upon, 3 of these
(A B C) being two months old and the
other 3 (D E F) being three months old.
These fowls were divided into three
groups; A and D were castrated, B and C
had one testis removed and C and F had
both testes removed but one testis from
C was placed between the coils of intes-
tines in the abdominal cavity of F while
one testis from F was likewise placed in C.
The birds A and D behaved as capons,
lacked the male secondary sex charac-
teristics, were cowardly in behavior, were
not attracted by the female and exhibited
a decided capon crow. They were killed
December 20, 1848 and a necropsy per-
formed. No testicular tissue was found.
Cockerel B was killed October 4, 1848.
His behavior had been that of a normal
cockerel and necropsy examination
showed the remaining testis to be one-
half again as large as normal. Birds C, E
and F had developed as normal cockerels,
showing well developed wattles, combs
and crows and behaved as males. Cock-
erel E was again operated upon and the
remaining testis, which appeared of aver-
age size, removed. He reverted to the
typical capon. Cockerels C and F were
killed January 30, 1849. Necropsies were
performed. The testes were found sur-

rounded by gut, oval in form and measur-
ing $15 \times 8 \times 6$ linien. Sectioning the
tissue revealed a white milk fluid which,
when examined under the microscope,
showed cells ($\frac{1}{450}$ - $\frac{1}{150}$ linien) resem-
bling spermatozoa. These spermatozoa
were motile. The conclusions were in
brief: (1) Testes are transplantable
organs. (2) This tissue grows as a plant
graft and does the work of a semen organ.
(3) The testis grows a true semen but has
no specific semen nerve. (4) These organs,
without the specific secretion nerve, act
and this must be because of the passing
of a secretion by way of the blood.

This appears to be the first experi-
mental piece of work which proves
an internal secretory function and
which also reaches a conclusion
essentially that believed today, con-
cerning this phase of physiology.
This experiment, like many others,
was apparently buried in the
literature. It did not create any such
turmoil as did Brown-Sequard's report
(1889-91) when he brought forth
similar views concerning testicular
extract. The name Berthold is not
familiar to most students of America,
and it would seem most interesting to
inquire a little into this man's life.

Arnold Adolf Berthold was born
February 26, 1803 in the Munster
district of central Germany. He came
from an industrious and sturdy stock
of craftsmen, who were in moderately
good circumstances for the times. His
father, Gerhard Dietrick Berthold,

* Read before Medical History Club, University of Oregon Medical School, Dec. 13, 1925.

was a master-jointer who always made a comfortable living for his family and succeeded in keeping them from debt during the hard war times which were quite prevalent throughout Europe at this time. Gerhard Dietrick Berthold was a very strong and ambitious man, frequently working from four in the morning until eleven at night. Arnold's mother, née Sophie Adams, was a daughter of the jointer Adams of Soest. She was not a very strong woman and was unable to care for her home as did most housewives of this age, consequently much of this work fell to the children. Besides Arnold there were four other children, one sister, Elizabeth Antoinette Clara, and three brothers, Johannes Georg, Ludwig Nikalaus, Adolph Franz Georg, and Gottlieb Johannes, all being older than Arnold except Gottlieb, who was three years younger. Johannes later became professor at the gymnasium in Detmold and Gottlieb second pastor in Petersburg on the Weser. The other two children died in childhood.

Arnold's early training was received in a righteous and peaceful family circle. The environment about which these youthful years were spent can best be shown by boyhood incidents as they appeared to Berthold.*

My remembrance of my childhood dates back to the 12th of February, 1806. This was when I was brought to my mother to see the new baby brother Gottlieb, and I received cookies . . . The day of his baptism with coffee, cookies and pipes for the men still is fresh in my memory . . . I spent my first years of childhood mostly in my father's

workshop, where we children with our friends could play with all kinds of pieces of wood and sawdust. In the summer our playground was in the houseyard. We had very few playthings and even at Christmas time we did not receive any . . . Still Christmas was for us the happiest day of the year . . . The "Gloria in Excelsis" was sung from the church tower at 8 P.M. Christmas eve and we all said our prayers. On Christmas morning we arose at 6 o'clock and found a beech tree limb on the table which was stuck in an apple and ornamented with two or three candles and few golden nuts. We received no clothing or shoes or presents, although I can still remember how happy I felt to find an ABC book on my plate one year. Upon the title page was a big rooster and some eggs and the words, "Early the rooster crows and early starts to learn." . . . The Sundays were always happy days. We had better things to eat and we all took our meals together, which was not the case work-days. My parents went to church with us in the morning and when father took a nap in the afternoon we played all kinds of tricks on him . . . The yearly markets with all their animals were big events . . . One of the nicest times of my childhood was the harvest . . . Riding was one of my great pleasures and I was very fond of animals . . . As a twelve-year-old boy I went hunting with one of our neighbors and regretted not to have a dog to take along as he did. I almost lost my life when skating as I broke through the ice but was saved by a friend. I dried myself in a nearby bakery before going home . . . As the years of my boyhood fell in war times we children represented ourselves as soldiers in most of our games. We frequently received head wounds which were cared for by rubbing a home-made sulphur ointment, which an old woman gave us, over them . . . We very seldom had a doctor . . . Lots of water and milk was our medicine. In the fall and spring we had to take a mixture of rhubarb-root, jalap and cream of tartar

* Rohlf, Heinrich. Fragment einer Selbstbiographie von Arnold Adolf Berthold. *Deutsches Arch. f. Gesch. d. Med. u. med. Geog.*, 3:74-100, 1880.

early in the morning and had no food until evening when a plate of soup was given to us . . . My mother was very well educated and very bright and smart. She was strict in everything. Her eyesight was poor and she could not see all the mischief we children did . . . She gave us our first lessons and I received many boxings on my ears because of my spelling . . . We had to work in the house a good deal . . . In the workshop of my father we boys also had many things to do and although I was never fond of the kind of work, later I was glad for all I saw and learned there . . . When I was seven years old I went to school and began to learn to write and count . . . Mother taught me to read. We also had Bible lessons. Our schooling was very poor, the teacher being a very rough man who whipped us much. In my ninth year I was sent to the gymnasium of my father's town. Here there were five grades . . . In the first were taught reading, writing, counting, French and Latin; in the second mathematics began; in the third, Greek. We also had a little geography. I liked natural history the best. We had very little teaching of religion but took lessons at our Minister's home once a week during the two half years before confirmation I was also fond of these lessons and especially of the teachers . . . My sister's years of illness kept me from doing my work at school well as I had to do much of the housework . . . I was confirmed the 13th of June, 1819.

Following the advice of his older brother, Arnold thought of studying medicine and chose the school which this brother was then attending. August 1, 1819, he and his younger brother Gottlieb set out for Göttingen. It was during this trip that an incident arose which gave young Arnold a definite desire to practice the healing art. The brothers stopped a few days at Weser and visited at the home of a friend who was a minister. The minis-

ter's dog became ill and Arnold found him to be mad. Nobody believed the young man until the dog had bitten a ten-year-old child and afterward the owner himself.

Following the trend of the times, surgery and medicine were still somewhat apart. Berthold decided to obtain a surgical training first and then widen this scope through studying and teaching. He received his doctor's degree on the 10th of September, 1823, but remained in Göttingen until 1824. It was during these five years that he received much of the training and inspiration which would later be of use in guiding his career. These were very busy days for the sixteen-year-old boy but his health was good, so that, despite his inherited astigmatism he worked long hours. The ordinary life of a student with its amusements and college activities was not followed, due, it is true, to a lack of means, but probably more important was the lack of time because of his many interests in philosophy, theology and science.

He was greatly interested in the teachings of Gottlieb Ernst Schulze who gave lectures in philosophy and from whom Berthold learned much concerning logic. This man seems to have been also somewhat of a psychologist and was well pleased with Berthold's work. Dr. Bonterneck, another lecturer at Göttingen along similar lines, was enjoyed by Berthold. Tobias Mayer seems to have been considered a very desirable teacher because of his many experimental demonstrations. Interest in his lectures on mathematics and astronomy was unusually great. This man was also a physician, as a large number of men interested in other sciences seem to have been at that time. Johann

Friedrick Ludwig Hausman (1782-1839), an internationally renowned mineralogist and geologist and himself a former student of Göttingen, conducted many local geological tours about the countryside. Berthold was a most interested student in these trips and also at the lectures which were the more fascinating because of the vast store of knowledge this man had gathered from his own extended geological tours throughout Europe. Berthold was a true student and undoubtedly his yearning for knowledge led to his close association with many of these scientists. He was an associate of many of the teachers of academic subjects. He became close friends with many members of the medical faculty. However, this friendship was not encroached upon as is shown by the high respect which he held for his teachers. Later in life Berthold said, "Eight of these men," speaking of the medical faculty, "I had the fortune of counting as my dearest collegian friends but I will always keep them in memory as my teachers."

Johann Friedrich Blumenbach (1752-1840) was probably the outstanding figure in the medical department at Göttingen at this time although it is certain that many other members were equally renowned in various medical specialties. In order best to understand the education and the train of thought to which Berthold was subjected a digression will be made to summarize the medical teaching of this age.

Eighteenth century medicine has been called by Garrison* the age of theories and systems and it may be added that almost every teacher had his own ideas about which should be

*Garrison, F. H. History of Medicine. Ed. 3. Phila., W. B. Saunders Co., 1921.

followed. As the nineteenth century was entered systematic medicine was brought more and more into teaching, the French school being the far advanced leader of the age. Claude Bernard, Laënnec, Bouillaud, Pinel and many others were doing most excellent work in France while Addison, Bright, Hodgkins and colleagues beyond the North sea were making careful clinical studies. Politically France and England as nationalities were unified though both countries had much turmoil. On the other hand Germany was a divided state; she was torn by wars and suffered the fate of the defeated. Even though such celebrities as Mueller, Helmholtz, the Webbers and Ludwig were at work, their teachings were not yet to be outstanding. It was not until after the first half of this century had past that the Teutons were advanced to leadership in science. Like the state, German medicine was divided into many schools. Phrenology, homeopathy, rademacherism, hydropathy, odic force, animal magnetism and many other narrow views held sway. The revolution of 1848 upset many of these views but many struggled until the bitter end. In 1819, when Berthold entered the university his instructors were all men who had been subjected to fancied theories, although as will be seen, many were the leaders in revoking these same precepts. Johann Friedrich Blumenbach was one such teacher. George Ernest Stahl (1660-1734) the father of the "dephlogistic theory" was a leader with influence whose animism was the starting point for many of the latter vitalists. Blumenbach has been called an 18th century vitalist and he must have influenced young Berthold through his teachings.

However, it can be said that Blumenbach as a naturalist was a leader for the age. It was his thesis on "The Native Varieties of the Human Race" (1776) that was the starting point for modern ethnology. He based his classification upon the shape of the skull and facial configuration as well as the color of the skin. Berthold was later to publish studies concerning this type of investigation in animals.

Fr. Stromeier was Berthold's instructor in pharmacy and analytical chemistry. Medical botany was taught by H. A. Schroder. Anatomy lectures were given by A. F. Hempel, and Conrad Johann Martin Langenbeck (1776-1851) who was professor of anatomy and surgery at this time. Langenbeck was considered a very able surgeon, being Surgeon General of the Hannoverian Army in 1814. He was a swift operator and devised operations for eye surgery. However, it was a nephew, Bernhard von Langenbeck, who has the great list of operative techniques accredited to this name. L. A. Kraus, who later aided Berthold in his return to Göttingen, gave the general lectures on pathology, therapy materia medica and prescription work. Pathology of the eye was covered by C. Himly who also gave clinics in ophthalmology. His lectures are described by Berthold as being "very spiritual and philosophical." Fr. B. Osiander taught obstetrics and J. F. Osiander surgical obstetrics and syphilis. H. Marx lectured on medical ethics and Fr. Pauli gave instructions in bandaging and dressings.

Arnold's work was pleasant and interrupted but twice during these student days, once in the spring of 1820 when he became a victim of scarlet fever and again in the spring

of 1823 when he was called to military service only to be rejected because of his myopia. His financial help through school was furnished by his parents and his eldest brother. Even though he received his degree at the age of twenty in the year 1823, his thesis apparently being "De Cauterio Actuali Seu de Igne ut Medecamento," he remained at Göttingen until the spring of 1824 when he set out to visit the clinics and universities in other parts.

Berthold first visited Marburg where he reviewed and studied the anatomical collection of Binger and attended the medical clinics under Bartels. At Giessen he came in contact with Ritgen and Wilbrand. The zoological museums in Frankfurt and Darmstadt were visited and a great interest shown in both. While in Frankfurt, Kretschmar, spoken of as a very busy man, taught young Berthold many things. Schleiermacher of Darmstadt also was interviewed by the young student. Berthold then departed for Würzburg where he took clinical instructions from three well-known men of the times, Schönlein, Textor and d'Outrepoint, the first named aiding in developing all German medicine.

John Lucas Schonlein (1793-1864) was the first to break away from the Nature Philosophy School, and started the Natural History school. He had a great desire to classify all medicine as one would botany or zoology, this classification being very vague. In 1840 this man was one of the first to give lectures in his native tongue instead of Latin. He was also one of the first to teach modern clinical ideas and used blood and urine examinations, percussion, auscultation and the microscope. It was such spirits as these that

must have played a part in developing the sense of investigation which Berthold exhibited throughout his life.

At Erlangen, Dr. A. Kenke and the "friendly" Schubert were met. In Heidelberg the anatomical collection of Tiedemann, the mineral and geology collection of Leonhard and the clinics under Chelius, Naegeli and Prichelt were all visited.

Goldfuss, Nels von Esenbeck and Noeggerath were visited at Bonn where many observations and nature studies were made. Arnold went in turn to many German cities and met many other teachers and practitioners. After a short visit at his home he finally settled in Berlin where he started to practice in the clinic of Hufeland and Osann. He was not content to do nothing but practice, however, and, still in his twenties, he visited many clinics, heard many lectures and conducted research. While here he published several papers, among them being reports concerning the head bones in gnawing animals, the action of mercury upon the salivary glands and experiments on the effect of coal gas.

At Easter, 1825, Berthold left Berlin and visited Dresden where Carus and the anatomist Seiler were interviewed. Leipzig and Halle were Arnold's next stop; at the latter place the collections of Meckel and Nitzsch were viewed with great interest. From here Berthold went to Jena where Lorenz Oken, the principal spirit of the Nature Philosophy School, resided. His teachings were enjoyed and it was through Oken's influence that Berthold studied natural philosophy. Oken was also the editor of *Isis* in which Berthold later published many papers. The first German Congress of

Naturalists and Physicians (1822) was due to the efforts of this man. Berthold learned to know the zoologist Zinken while at Weimar and regretted greatly that he failed to see Goethe. He later visited the hospitals at Baden-Baden, Strassburg, and Darmstadt after which he arrived in Paris where the summer of 1823 was spent.

While in Paris many acquaintances were made through whom this young man's field of knowledge was increased. He enjoyed greatly the work of the naturalist Strauss-Durckheim who taught him the anatomy of insects. Georges Cuvier, the comparative anatomist, gave lectures which were attended by Berthold. Cuvier was a firm believer in spontaneous generation, fixity of species and preformation of the embryo. Ornithological lectures by Geoffroy St. Hilaire were also attended during the summer as were the lectures by Dumevil on fishes. Although Berthold was very busy with his diverse studies he still found time to write a treatise on the thyroid gland of the parrot.

On September 15, 1825, when returning home from these studies, he attended a convention of physicians and naturalists and gave a report concerning the relationship of the French and Germans in natural science. This seems to have been the first convention of its kind and was followed by many other such meetings. Berthold was a strong advocate of this method of bringing scientists together and exchanging scientific views. He also gave a report at the Heidelberg meeting in 1828 on the embryology of birds and another in Bonn in 1835 concerning a study of sound.

Berthold returned to Göttingen in October of 1825 and began lecturing in

physiology. He remained with this university for life being advanced to Professor of Physiology in 1835, which place he held until 1840 when he became Director of the Zoological division of the museum. He died on February 3, 1861.

He published, besides the many research reports mentioned, many other treatises and textbooks. It is interesting to note that in 1828, when only twenty-six years of age, Berthold published his first textbook of physiol-

ogy which was a book of nine hundred and four pages. Besides being an able physiologist, anatomist and physician, he also, with Bunsen, was the discoverer of iron oxyhydrate as an antidote for arsenic. Heinrich Rohlfs, whose history of German medicine was published in 1875, says of Berthold, "He belongs to the most distinguished physiologists of the 19th century. Among the Göttingen Professors he distinguished himself through his unselfishness."

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THE FIRST GENERAL MEDICAL TREATISE PUBLISHED IN THE WESTERN HEMISPHERE

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EARLY American medical essays, tracts and case reports, as far as they are known, have been accorded their chronological sequence in the history of medicine in America. As these early American dissertations or monographs were not numerous, they are for the most part so well known and so sufficiently noticed in the medical histories by Garrison, Packard, Bass and others, that they need only be mentioned as a background for the present contribution to American medical history.¹ Not one, however, of the early American medical publications can be considered as anything of a general (much less systematic) treatise on medicine.

The interest of medical historians has been confined largely to these early essays, tracts and case reports, and has been but imperfectly extended to the larger (and later) compilations of a general or textbook nature. That early medical compilations and textbooks have received comparatively less notice is quite natural, as such works, at least in the eighteenth century, were not (as were the essays and case reports) conceived as vehicles for the presentation of original contributions to the advancement of medical science. However, the practical social importance of a textbook, or at least a pioneer textbook, is not without some historical consequence.

As a contribution to the early history of American medical compilations, I wish to draw attention to a work that has apparently received

no notice in medical historical literature. I refer to a book which was perhaps the first of its kind to be published in the Western Hemisphere. Though much more than quasi-technical, the book is not of a distinguished professional character. Undoubtedly however, the compilation referred to, Venegas' "Compendio de la Medicina: ó Medicina Practica," was of as good a medical literary quality as could be expected for the time and locality in which it was produced. Restricted as it was to a portion of the Western Hemisphere by its text being in the Spanish language, it should nevertheless, in the present state of our knowledge, be recognized as the first expression of medical textbook production in the Western Hemisphere. It antedates any similar American work in the English language by over twenty years. Needless to say, however, it had no stimulating effect on the production of any American medical compilation in English.

Venegas' book, though designed to be inclusive of most medical diseases, cannot be described as being either systematically or pathologically integrated. Numerous symptoms were treated as though they constituted pathological entities, and many of the section headings were but rubrics under which were placed several disorders, more or less related, each of which would today receive an independent discussion. The alphabetical arrangement of the section headings or rubrics also operated to prevent

further a systematic presentation of clinical theory and practice.

Venegas wrote his book, as he

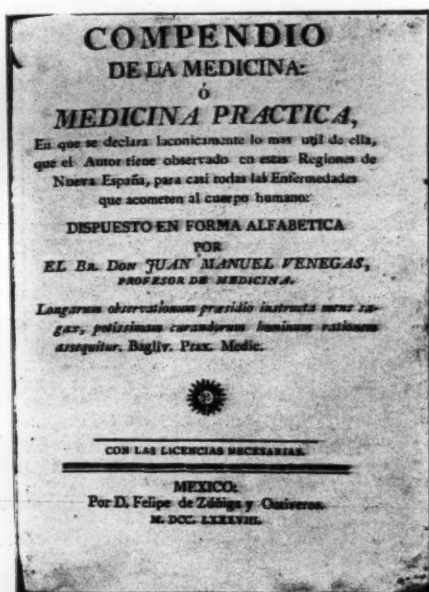


FIG. 1. TITLE PAGE OF FIRST EDITION.

claimed, for the instruction of the laity, and he definitely aligned it with several earlier medical works written for domestic perusal. In his introductory advertisement to the reader, he mentions (depreciatingly) the following antecedent works of a similar popular tenor: the works of Madam Fouquet, the compilations of Juan Esteynefer and of Gregorio Lopez, the "Domestic Medicine" of Buchan (with the additions of Duplanil, and of Sinnot), the "Advice to the People" of the famous French physician Tissot, and the "Dictionary of Health" compiled by two physicians of Paris.² Though he claimed to have compiled his book for popular instruction, Venegas manifestly presupposed his readers to have such a knowledge of medicine as could only be found

among the very inconsiderable portion of the population who had enjoyed the advantages of a liberal education. It is therefore perhaps most correct to consider his book as a work written for the amateur physician, the clergy (who often considered themselves not unskilled in medicine), pharmacists, and the general practitioners of small Mexican communities not academically trained (who were often the town barbers, though sometimes the *alcaldes* or local nestors).

Venegas' book unquestionably made available in Latin America numerous prescriptions, therapeutic rationalia (if such they can be called), and working formulas, but the indications for therapy were given for the most part too abortively to be of decided value. The pharmacologic aspect of the book constitutes its chief merit, though it should not be considered a pharmacopeia in the strict sense. As a presentation of pathology the text is lacking in some of the pathological knowledge of its day. Many of the sections read as though they were pages out of Galen or Celsus, though only in connection with epilepsy is the use of amulets or superstitious practices referred to. Polypharmacy (at least as to active principles) is laudably absent, and there is mention of scarcely one of the inert or mystic concoctions in common use during the seventeenth century. Preparations of scorpions and of roundworms are prescribed for some diseases, and woman's milk enters into the composition of a few soothing lotions, but no foul substances are prescribed as internal drugs, though human urine and a decoction of cow dung are recommended as local applications. There is throughout the book an attempt at

rationalization by means of the later humoral theories, though the book reflects the mind of a practical (and

extraordinarily hyperlaudatory dedication of his book,³ from the approbation that he had to obtain from

322 **PURGANTIA.**
uso, de melleo dulce quince granos, de diagridio nueve granos mecleense, y tomense, continuando su uso por mas ó menos dias regulados, segun la resistencia de el enfermo.

Purgas suaves, ó antiphlogisticas.
LAS minorativas de el numero tres, ó la leche de Mechoacan, en cantidad de una dragma.

Purgas para los cuerpos humedos y racios.
LAS del numero ochenta y tres.

Purgas comunes para los Adultos.
TOMA de polvos corraquinos dos escrupulos, de tartaro vitriolado un escrupulo; mecleense.

Item: De polvos sutiles de pastillas de Mechoacan tres dragmas.

Item: Una onza de sal catartica, que llaman vulgarmente de la higuera, deseada en agua tibia.

Item: De polvos sutiles de xalapa treinta granos, de saf de tartaro un escrupulo; mecleense.

Esta polvos han de tomarse con una posqueta de agua tibia, en ayunas.

Item: De extracto de xalapa diez granos, de xarabe violado una onza; mecleense muy bien.

Item: De agua angelica quatro onzas. Estibiese para suar.

Item: La almendra de una haba mediana de Gastermia, ó media de las grandes, marcada.

En ayunas han de tomarse las purgas, y hasta las tres horas se desayunará el enfermo con un posito de chivoate preservandose del ayre, y usando por comida un simple puchero.

Lactica purgante.
TOMA de ocimiento de malvas con raices, manzanilla, y media almendra de maney asada tana y repida; y mecle-

323 **RACEDO.**
ciense con un posito de miel rosada, media onza de polvos de jabon, y una dragma de sal de colina.

RACEDO. La Raquera es la forzada, ó omnia prolesion de la voz. La causa inmediata es la inobediencia de la glotis. Las antecedentes son la debilidad, ó el demasiado calor de los organos de la respiracion. Las procatarticas son primeras: acrimoniales alcalinas. Segundas: inflamacion de los musculos de la laringe. Terceras: concretos, ó espesura de la linfa que riega las fauces, por las causas del asma, principalmente por el agua, y ayre frios tomados, estando calientes el peiton y la garganta, lo qual se llama *parme, ó resfria de pecho*; ó por el humor gaisco, quando llega á depositarse en las fauces. En las enfermedades graves es bien peligroso este mal, ó muy rebelde.

NUMERO CIENTO Y DIEZ Y SIETE.
Curacion de la Raquera.

EN las acrimoniales alcalinas y ardores de la sangre, se indicarán los remedios aperitivos; se chuparán los limones frescos, que sean un tanto restringentes; y á las espaldas se untarán las unturas anisibeticas. En la inflamacion de la garganta, se sangrará al enfermo las veces que fuere necesario; se le frotará el pecho, y garganta las unturas anisibeticas; tomará las bebidas diluentes; y chupará los limones frescos. Finalmente en las tercenas causas son necesarios los remedios discutientes, y stomaticos.

Remedios aperitivos para la Raquera.

EL ocimiento de orozco, cebada, pasas debrindadas, malvas, y flores de anapais, endulzadas con miel violeta; ó la infusion de clavetes blancos. Se tomarán bien calientes.

Item: De flor de harina de habas, y de polvos de simar candi partes iguales de cada cosa; amonchen, y tomen de quando en quando, como chupado.

Item: Las raspaduras de Ingento, ondas del mismo modo.

FIG. 2. TEXT PAGES, REDUCED 46:100.

not unpracticed) therapist rather than that of a theorist. Whereas Venegas was not notably proficient in propaedeutic discrimination, he wrote nevertheless in a clear, concise and direct manner.

Venegas' descriptions of disease were but rudimentary, and his differentiation of morbid processes was not much more extended or enlightened than could have been found in the works of Celsus, Mesuë, or the medieval treatises such as Gordon's "Lilium Medicinæ." One is struck however by a freedom of the work from superstitious practices; though empiricism rules throughout. The only integrating theory permeating the book is the old doctrine of humors and acrimonies.

Amusing sidelights on the modes of thought and the social customs of his day can be obtained from the

the "Royal Tribunal of Protomedicati," and from the license or *nihil obstat* that all authors had to secure from the Catedratico Defender of the Faith, who encountered nothing in Venegas' book "contrary to the purity of our holy faith, worthy customs, or regal enactment of his majesty (whom God preserve)." The bishop, "great pillar of the church," to whom the book was dedicated, seems not, according to the "Catholic Encyclopedia," to have played any conspicuous rôle in Mexican politics or in ecclesiastical advancement. As to the protomedicati (two of them "Doctors and Masters" and one of them a "Doctor Jubilado"), it seems that they required over two months⁴ to examine a book that a physician could have read through in less than two days.

As to Venegas' career I have learned

nothing, though it appears that he held the title of baron, and that he commenced the practice of medicine in America some twenty-seven years prior to the writing of his book (which was probably written in 1774). If he came to America as a physician in 1757 or 1758, he must have been born prior to 1735. It is unlikely therefore that he was living when his book was republished in Philadelphia in 1827. Venegas was at first something of an itinerant, as he writes of having practiced in "various parts of this vast Continent." Though officially acknowledged to be a professor of medicine, it is clear from the approbation of the protomedicati that there were at least three physicians in Mexico City who held equal or greater political preferment than he did; and from their titular styles it would seem that there were academic honors greater than the simple title of doctor, which was all that his book styled him.

It is believed that copies of the first edition of Venegas' "Compendio" are extremely rare. There has been until lately no copy in the Library of the Surgeon-General's Office, United States Army, though I have recently supplied the deficiency by permanently depositing my copy therein.

The following list of the section headings, with illustrative extracts or comments from the first one-third, should considerably supplement the above remarks as to the scope and doctrinal content of Venegas' book:

Abscessus interni. Distinguishes cellular infiltrations without pus formation under the name of abscessos or apostemas improprios. Abdominal abscessos treated with strong and continued purgation.

Abortus. "Epilepsy is apt to follow

abortion when this is procured by remedies."

Acida. "Those who have acid eructations ought not to drink wine. Acids taken in immoderation attenuate digestion, which is disturbed; coagulations are formed which cause obstructions and maintain intermittent fevers."

Acrimoniae. "Alkaline acrimony originates from greasy, spicy, abundant eating, as much chile and excess of chocolate, excessive use of tobacco and alkaline and spirituous drinks, retention of excrements, very laborious work, sleeplessness, and violent passions."

Alvus adstricta. "Constipation is dangerous in fevers, diseases of the head and hypochondriasis, in plethoras, and stagnancy."

Aneurismata, et Varices. Distinguishes thrombosis under term of false aneurysm.

Angina. Includes among many other forms the "angina convulsiva" (rabies?).

Anorexia; Disorexia. Stomach drops: 20 drops of a 20 per cent solution of sulphuric acid, twice daily.

Apoplexia, Morbus atonitus. Recommends numerous sternutatories, drinks, soothing lotions, topical applications, vomitories, and active purges.

Aptbae. "Ulcers, or the fire of the mouth, is an agglomeration of small sores that break out within or without the mouth, and occasionally extend to the esophagus, stomach and intestines."

Aqua. Two pages devoted to a classification of Mexican medicinal springs, with a short account of hydrotherapeutic methods and resources.

Artbritis. Includes gout and sciatica. Describes a guiac-sarsaparilla-polypodium drink, linaments, fomentations, balsamics, and a plaster for sciatica, but stresses vapor baths.

Asthma. "Is commonly incurable." Distinguishes two types, humid, and dry or suffocative.

Atrophia, Tabes, Marasmus. "Tabes dosalis originates from an habitual gonorrhea." Insists on avoiding overfeeding

with heavy foods; gives methods for making easily digested foods, sponge cake, breast of chicken and almond stew, and other nutritious delicacies.

Aurium-morbi. Mixture for deafness: pulverized Venetian soap, 16 parts; pulverized camphor, 16 parts; oil of rosemary 1 part.

Azogamiento (Mercury intoxication). "The specific in these cases is the fulminate of gold. Take of fulminate of gold one scruple. Make into twenty-four pills with fluid extract of fumaria, to be taken within four successive days." These pills are to make the patient sweat. Purgatives are also recommended.

Bilis. Medieval notions on the physiology of the bile, and a moderately stated biliary doctrine.

Bradypepsia. "This disease has a long duration; is the most common source of cachexia, hidropesias, obstructions and detained menstruation."

Bubo. Includes glandular manifestations of bubonic plague. "The pestilential molestations that appear on the eleventh day of the fever are good. More dangerous than those of the groin are those of the neck, chest, and behind the ears."

Bulimia. "Results in habitual disease in which is vitiated the digestive juice, the saliva, the bile, and the rôle of the pancreas; it often ends in cacochilia, hypochondria, and chlorosis [etc.]. It is treated by vomitories, absorbent remedies, and invariable attention to the dominant acrimony."

Cachexia, *Cacochilia*, *Cacochimia*. Treated by regimen, diet and purgation.

Calculus urinae, *Lithiasis*. "Lithiasis is generally difficult to cure; those who suffer with the disease generally die physically altered, bedridden, and ulcerated. The last resources are dilatation of the urethra, puncture, and lithotomy."

Calli, et Clavi. "Nerve tumors that occur in any part of the body, originate in continued exercise and alkaline acrimony." Have three stages: inflammation, scirrhus, and cancer. Recommends a

plaster of mellilotus, and a mucilage of the wax of Campeche.

Cancer, Carcinoma. "By means of amputation, cancer is very rarely subject to a radical cure, but only if superficial, movable, and circumscribed. If adherent, deep seated or ulcerated, there is no cure except palliation."

Carbunculus, Carbo, Anthrax. "External treatment is by extirpation, or supuration, which is commoner and safer."

Cardialgia. Gives credence to the notion that suppression of perspiration or a chilling of the feet or abdomen may cause pain in the stomach that can terminate in supuration and death.

Cascadura, Engrasamiento. Mentions gradual physical wasting of miners.

Catalepsia, Catocbus. Bleeds the patient from the feet, and wakes him up by insufflating white vitriol up his nose.

Catarrhus. "The simple, fluent catarrh is commonly profitable; that of scorbutic origin, suspicious; the epidemic, dangerous; and that which occurs in the lungs of elderly persons, wicked."

Causae morborum. "All causes of disease can be reduced to three: immediate, antecedent, and procatartica (vices, or errors in the use of the six un-natural things, or other diseases that they can engender)."

Cephalalgia. "The essential cause is the extension or rigidity of the cerebral vessels." Distinguishes hemicrania. Mentions many causes of cephalalgia, with treatment according to cause.

Chlorosis. Treats with regulated regimen, exercise, purgatives and antimony. "The abdomen is to be anointed daily with the 'unguento chlorotico' [formula not given]."

Cholera morbus. Internal treatment fairly rational. "The disease is quick acting and should be treated promptly . . . In debilitated persons is to be applied to the stomach a recently killed hen, opened down the back."

Colica. Demulcent drinks, aperients, laudanum and several anodyne ointments.

Combustio. "For burns of the eyes take equal parts of rose water and woman's milk to make fomentations without intermission." Gives formulas for several lenitives.

Contussio. In addition to many topical remedies he prescribes draughts of an acetified infusion of elder flowers.

Convolvulus, Chordapson, Ileos, Iliaca passio. "An extremely rapidly developing disease from which few recover." Prescribes hot baths. "Cover abdomen with a mess of tripe or emollient herbs." "After applying to the abdomen without intermission a hog's omentum soaked in an anodyne anti-colic ointment, one prescribes a labiative of oil, honey and milk followed by the practice of 'chinanas' [the swallowing of pebbles]."

Convulsio, Spasmus, Contractio. Includes tetanus. Enumerates emprosthotonos, opisthotonos, trismus, priapism, satyriasis, aphonia, etc. Prescribes a laudanum draught, "inunctions of a nervine ointment," etc.

Cordis palpitatio. All of cardiology on a page and a half.

Crises. "Crises are an undertaking (negocio) purely mechanical in which the solids, irritated by the volume of the liquids expel them by evacuation, if the humor is fluidable, or by pure depuration (which is called metastasis) in being condensed so that the materials should be scattered."

Deliquium. "The immediate cause is a slight suspension of the movements of the blood in the cerebral vessels, or of the nerve marrow in its origin . . . There are five different forms: leipothimia, loss of speech, or for a little time the loss of sensation or movement; syncope, when the dropping of the forces covers the patient with a cold sweat; scotoma, when vision is obscured; vertigo, when objects seem to move in gyrations; asphyxia, when the body being cold, the pulse and respirations are difficult to perceive."

Dentium morbi. Four pages devoted to dental pathology. Four prescriptions to glue or fix in loose teeth; one, tincture of

gum-lac in red wine. Numerous remedies to whiten dead teeth; six formulas for toothache drops. Recommends repeated cauterization of dental fistulas. Advises mouthfuls of whiskey to control hemorrhage following extractions.

Diabetes, Urinae profluvium. Includes urinary incontinence, frequency due to local irritation and polyurias, among which is mentioned the form with saccharine urine and a "wasting of the whole body."

Diaeta. Includes regimen and exercise.

Diarrhoea, Fluxus ventris. Gives eight formulas for astringent preparations, three opiate remedies, five roborant restoratives, demulcent drinks, and topical applications to apply to the stomach in febrile diarrheas.

Dysenteria. This subject, with that of diarrhoea, is given comparatively fuller practical discussion than most subjects. Treats with initial purges followed by demulcent drinks, and ultimately by restringents. Gives four formulas for cooling anodynes and five narcotic sudorifics.

Dysuria. Mentions as causes: "Alkaline acrimonies, inflammations of the urinary bladder, ulcers of these parts, carnosities of the urethra, suppressed gonorrhoea, stone, use of cantharides, convulsive accidents and metastases to these parts of venereal, arthritic, or catarrhal humors.

Dolor. Chiefly a description of pains by regions of the body.

Ebrietas. "In the first stage, in which the drink is exercising its fury, one repeatedly drenches the extremities and the pudenda with cold water; vomitus and evacuation is procured; and all aliments are interdicted; sleep is induced, with which diligences this frenzy ordinarily terminates . . . When, however, drunkenness is habitual, the following cure is established: obtain the utmost abstinence in fruits, herbs, water and indigestible foods; within the twenty-four hours is served only one meal sustained with substantial broths, or chocolate; roborant and aperient remedies are used, and every

day much exercise on horseback or foot. For dried-out patients frequent bathing is instituted."

Empyema. "This disease is mortal if one does not quickly produce drainage of the pus. Moreover one does not confide the treatment to drugs, but without loss of time effects paracentesis properly between the fifteenth and twentieth days. But if the empyema is become old, a colloquative diarrhoea is present, or the vitality shall be much prostrated, the paracentesis accelerates death."

Epilepsia, Morbus caducus [Etc.]. "Inherited epilepsy is incurable, as is also that of long standing; that of children commencing at sixteen years of age, or of adolescents at twenty-five; that which gives rise to hypochondria degenerates into insanity. That which the sun brings on has its seat in the intestinal tract or the uterus."

Erysipelas, Ignis sacer. "In the erysipelas of the face, in addition to purgation, if become long drawn out or indolent, it is convenient to rub them with very hot wax from candles, or with urine from healthy persons."

Facies morbi. Numerous skin diseases of the face, none satisfactorily distinguished; formulas for numerous cosmetic preparations.

Febris. "Is a frequent, constant, and preternatural movement of the blood. The immediate cause is the augmented pulsation of the heart." Over nine pages on fever in general.

Febris acuta simplex. "Is that which without any interval whatever continues to the end for several days; is symptomatic or essential. The first is that which proceeds from inflammatory accidents, the essential is that which does not originate in any other disease; and is called ephemeral in lasting only a day or two; synchal, if prolonged to six, eight, or ten days; and simple continued fever if extended to the fifteenth or twentieth day." Treats with evacuation, cooling, antifebrile drinks, and more or less repeated bleedings.

Febris acuta gravis. "Is that fever which above running for several days has towards the end, without interval or period, grave effects that distinguish it from simple fever. It is divided into three species: Ardent, Malignant and Ecthymatic . . . The ecthymatic fever is that in which appear eruptions on the surface of the body, which are of three kinds, efflorescences, exanthems, and pustules."

Febris pestilentialis, Pestis, Epidemia. "Initiated by an invisible poison, which commencing in the austral air, commonly propagates itself after encountering the boreal air . . . This constitution of the air in the majority of instances originates from corrupt exhalations, vapors a long time enclosed, effects of inundations, foreign foods, humid stench, poisonous places, exuviae of badly nourished bodies, [etc.] . . . The method to cure towns already plague-ridden is: to wash the streets, plazas, open sewers, meat markets, stables, and similar sickening places; to remove afar the impurities; impede the entrance and communication of the sick with the well; to bury the dead in the fields; and burn much pitch in all houses and edifices: the houses being sprinkled with vinegar, and planted with winter-greens and roses. And the people to foment themselves on the temples, foreheads, mouth and nostrils with vinegar."

Febris lenta "is a suave, continued and chronic fever, with at times edemas in the body, and cachexias. The immediate cause is the ebullition of the marrow of the nerves." Contains in a general way the rheumatic and focal infection groups. Gives six formulas for "anti-hectic ointments." Describes mud baths for rebellious cases.

Febris intermittens. "Chills is that fever which repeats by periods; is divided into erratic and constant, the latter into diurnal, tertian and quartan. These may be doubles (as when two or three accessions occur in the same day)." Mentions hematuria (black water). Probably includes yellow fever (yellowing of the body shortly after invasion). Has "an

ointment for chills." Quinine pills: "Take six drams of finely powdered quinine, and half as much refined sal ammoniac. With tragacanth jelly, or nopal jelly, make gilded pills to be taken in three distinct times before the commencement of the chills" (equals 144 (!) grains of, probably crude, quinine in about twenty-four hours). His orange and honey conserve contains 192 (!) grains of quinine to the dose.

Flatus. "Its complete cure is difficult in the aged, in the hypochondriacal and in the hysterical." Again prescribes topical applications to the abdomen.

Fluor muliebris, Leucorrhoea. Includes gonorrhea, though he specifically distinguishes it by name and by its chief acute characteristics.

The remaining subject headings are the following:

Gangraena; Gingivarum morbi; Gonorrhoea; Graviditas; Gutturis morbi; Haemophthisis, Haemoptoe; Aemorrhagia; Haemorrhoides; Hepar morbosum; Hernia Cele, Ramex, Crepatura; Hidrops, Aqua intercus; Hypochondriacus morbus; Hysterica passio, Uteri suffocatio; Icteria, Icterus, Morbus regius; Impetigo, Pecten, Lichen; (Etc.); Incubus, Ephialtes, Nocturna strangulatio; Infantum morbi; Inflammatio; Insania, Decipientia, Dementia, Delirium; Ischuria, Urinae suppressio; Lac; Lethargus; Lienis morbi; Lochia; Lues venerea; Lumborum dolores; Lumbrici; Luxatio; Mammarum morbi; Menstrua nimia; Menstrua retenta; Morbi; Muerti aparente; Narium morbi; Nephritis; Obstructiones; Oculorum morbi; Oris morbi; Panaritium, Paronichia; Paralysis; Nervorum resolutio; Parotides; Partus; Pathemata animi, seu passioness animae; Perimneumonia; Phlebotomia (Etc.); Phrenitis; Paraphrenitis; Phthisis pneumonica; Pleuritis; Pudendorum morbi; Pulsus; Purgantia; Raucedo; Respiratio; Rheumatismus; Rigores; Sanguis; Scirrhus; Scorbutus; Scrophulae, Strumae; Singultus; Sterilitas, Aphoria; Stranguria;

Sudor nimius; Tenesmus; Tubercula pulmonum; Tumores; Tussis; Variolae; Venenum; Ventriculi morbi; Vesicantia, Vesicatoria, Caustica; Ulcera; Vomitus; Urina; Uteri morbi; Vulus.

It should be noticed that the scale of weights employed by Venegas are based on the jequirity bean but that the scruple as he knew it was composed of 24 grains (1 pennyweight) and that consequently his ounce of 24 scruples (8 drams) had 576 grains instead of the present apothecaries' ounce of 480 grains.

The following literal translation of Venegas' section on pneumonia, with a retention of the original punctuation, affords a good sample of the then current notions on pathology and practice, and an exemplification of Venegas' method and style of writing. I am indebted to Dr. Octavio Garcia, formerly of Monterey, Mexico and now of St. Louis, for assisting me with a part of the following translation:

Peripneumonia. Pneumonia is a pain within the chest with fever, cough, anxiety, difficulty in breathing, and sputum more or less sanguinous. It is divided into *true*, *false* and *scorbutic*. The *true* (form) is inflammatory, or acrimonious. The inflammatory is accompanied by marked chilliness, high fever, reddening and congestion of the face, headache, feeble and unequal pulse, and very bloody sputum. The acrimonious has a frequent and dry cough, inquietude, fugacious pains, fever, and acrid heat. *False* pneumonia is commonly proper to persons phlegmatic, weak, aged, and those who have weak muscles, who have done laborious work, especially in the rainy season. It commences with a frequent, small and easily compressible pulse, and never tense, or hard, little fever, chills, and passing flushes, oppression and weight of the chest, faintings, headaches,

coated tongue, vomits, and blood which on venesection forms a loose clot, and without consistency.

Scorbutic pneumonia is most common in Sea-faring persons, and in those who inhabit marshy places. It occurs with an early difficulty in breathing, loss of strength, goose-flesh, hot flashes, pains in the whole body, continued fever, troublesome dry cough, weight in the cavities, or regions of the abdomen, pulse frequent, small, and weak, clammy sweats, and irregularities, anxiety, thin fetid, sanguinous or dark sputum, eruptions of red, livid spots, or black, urine blackish, or of the color of crude lye, and commonly without sediment. The cause of this pneumonia is the scorbutic dissolution of the red part of the blood.

The true pneumonias since they originate from the general causes of inflammation, and from alkaline acrimonies, are most common in the constitutions of cold and dry atmosphere. These dispositions of the winds dry and wrinkle the skin, close its pores, and do not allow any exhalation but just the most tenuous part of the transpiration, from which results the gelatinosity of the blood, and its impermeability through the smallest ramifications of the vessels, is the immediate cause of all the inflammatory diseases.

Having then, the skin constricted, a large part of the blood is conducted to the interior of the body, principally to the lungs (by reason of the soft and lax disposition of the larger portion of this viscus) from which results the cough, the oppression of the chest, the effort to supply the transpiration, giving rise to the expectoration, the lack of transpiration; but if a cold air is breathed, this evacuation is made difficult, and thence happens to these parts that which has already happened in the face, feet, and hands of those who are exposed to an excessive cold, that is inflammation, ulceration, and even gangrene.

In effect, by the said causes, or by whatever other inflammation, the blood

being viscid, it embarrasses the air cells, and small pulmonary spaces, and obstructs the small arteries of the pleura, from which immediately arises the pneumonia, and the pain at the side of the inflamed chest. The cause of the acrimonious pneumonia is the exhalation, and detention of corrosive alkaline material in the small vessels of the lungs.

False pneumonia originates in a lymphatic congestion in the air cells, and small spaces of the lungs, that obstruct the pulmonary vessels, and the bronchioles. This disease becomes fatal when there result grave anxiety, stertorous breathing, constant oppression of the hypochondriac region, feeling of weight, and a bluish color to the face.

The *cough* originates from the irritation that is given to the fibers of the lung by the swelling of the vessels. *Bloody sputum* comes from the rupture of these distended vessels, and by the efforts of the imprisoned blood.

The *difficulty in breathing* is the effect of the obstacle that is encountered by the air-sacs of the lung by the distended vessels, because then they can not dilate freely. The *pain* comes from the irritation; and for this cause, respiration becomes augmented. If the pain is *dull* it denotes that the seat of the disease is in the lobules of the lung, which on account of their loose texture are incapable of vivid sensations; but if it is *sharp*, it indicates that the pneumonia is found in the bronchi, whose elastic texture makes sensation vigorous. The *fever* is a symptom of inflammation, or of the internal movement of the blood. The ability of the carotid and vertebral vessels to stand out produces *headache*, *redness* and *swelling of the face and neck*.

The pneumonia is an acute accident, that lasts at most, until the eleventh day, terminating with *free, abundant and foamy sputum*; with *copious sweat*; *abundant urine* (this begins at the seventh day) and *somewhat thick*, with at first a reddish sediment, that later turns white; it can terminate by *resolution*, if the legitimate

remedies that are indicated are administered; by *gangrene* if the pains were very grave, if there came to the skin blue or black patches, if there were stertorous breathing, convulsions, coldness of the extremities, pernicious vomiting and sputum greyish and fetid; or by *bilious diarrhea*. Finally it sometimes terminates in *abscess*, when the aforementioned crises are lacking. If the sputum comes out somewhat black, porous, thin, and sometimes with pieces in it like cooked bass, it is a sign that a part of the lung has been sloughed off. In this case the patient will surely die.

It can be told that an abscess has formed, if after the time for the pneumonia has passed, the chills return, if the pulse becomes very soft; if the patient is delirious, if once the pain has been subdued, there still remains difficulty in breathing. The (*pleura vomica*) or abscess already formed manifests itself by a strong dry and continuous cough, particularly after having taken food, labored breathing, patient only tolerating lying on the side of the pain, much thirst, night sweats, foamy urine, debility and wasting of the body. In the height of the pneumonia, an intermittent pulse is frequently a mortal sign.

NUMBER ONE HUNDRED AND TEN

Cure of the Pneumonias

In *inflammatory* pneumonia from the very beginning is instituted copious bleedings, repeated up to the third or fourth day. And when the pulse becomes stronger and fuller, the chilliness constant, the fever violent, the patient gives forth florid and foamy blood, the oppression of the chest and the difficulty of breathing maintain themselves, and in the extravasated blood appears a dense and stringy clot, which therefore would tend to persist. At a later time if the pain and inflammatory symptoms recrudescence, the bleedings are to be repeated, but in less quantity.

Always that the vessels are overloaded with the abundance of blood, dilated

more than their natural tone, they lose the impulsive force, and present a suppressed and easily compressible pulse. In this case bleedings are most necessary to restore the tone to the vessels, reestablishing the free movement to the fluids. Of this kind are many violent pneumonias, in which the patient experiences an excessive exhaustion, great anxieties, weak and somewhat tremulous pulse, extreme chills, cold and clammy sweats, brilliant fixed and inflamed eyes, tumid and discolored forehead, etc. The cadavers of those unhappy [decedents] have demonstrated that the lungs in similar cases are stopped up and filled with a hard, very heavy blood, and of the color of liver. Venesection then executed on both arms has given very beautiful effects in pneumonia.

Rare are the pneumonias that terminate perfectly without free expectoration; and whenever the sputum is abundant and is only tinted with streaks of blood venesection should be suspended. Because in these cases bleeding can be dangerous for in the weakened lung this favorable evacuation is suppressed. If the patient expectorates tenuous viscid and somewhat blackened matter it is a sign that the blood is in a state of a putrid dissolution; and then only with the greatest caution should bleeding be practiced.

It is also frequently given though not in great quantities diluent saponaceous drinks; cooling and emollient enemas should be given omitting them when the sputum is given out freely; pediluvia or baths of the legs in emollient herbal infusions. Active expectorants, while the inflammation is not subsided are pernicious, equally pernicious are purges when the sputum is free-flowing. Buccal detergents shall be at first demulcent (but if the sputum is thin and acrid the detergent should be bland and opiated) but in the progress, according to whether the sputum becomes more tenacious, they should be changed gradually to more diluting and attenuating.

In *acrimonious* pneumonias a bleeding

from the arms should be made at once and even repeated if found necessary. Then if the private passageways should be dirty there should be administered a bland emetic with oxymel; but if they are not this is omitted and at intervals fresh and emollient enemas are given which are suspended when the sputum is free. For drinks the paregorics should be used, or emulsified chicken broth; buccal detergents should be sucked; into the chest bland pectoral ointments should be rubbed, and to the shoulders anti-hectic ointments should be rubbed.

In the *false* or *spurious* pneumonia it is at times excusable to bleed; then an oxymel emetic should be given, emollient enemas and also diluent saponaceous drinks that should be at the same time diaphoretic, and then at times a paregoric; diluent buccal detergents should be used and use should be made of scarification on the neck and shoulders and besides this blistering substances (one broad at the back of the neck and two on the legs). Urine that is clear and thin in this pneumonia is bad.

In the *scorbutic* pneumonias bleedings, and blisters are of bad use: there should be used with frequency the cooling anti-scorbutics, among which a drink that is very useful is called *sangria* (blood orange), and the infusion of figs, rose, and of flowers like the red poppy partially fermented, with spirits of sulphur. The raw yellow sputa are bad; but a good sign in all accidents of the chest are the abundant turbid, reddish yellowish sedimentous urine. Emollient enemas, used with moderation, are very useful; but of great necessity, the pediluvia, and sinapisms on the legs.

If the pneumonia commences to degenerate into an *abscess*, drinks that soften and ripen should be administered in abundance. But if the abscess is already formed, there should be breathed in continuously the vapor from hot water, much exercise should be made, and every half hour an ounce and a half of the following should be given

Mixture to burst Abscesses of the chest.

Take the fine powder of onion one half ounce, of oxymel with calcium four ounces, of barley-water with infusion of elder flowers one pound: mix them.

Also the abscess at times breaks itself, by means of vomiting, brought about by giving a cup of linseed oil, or with a drink that breaks abscess of the chest. See the title *morbi*. Food in pneumonia must be light and whatever is given inside or outside must be lukewarm.

Demulcent detergents

Take of the pulp of the chicle tree four ounces, of pulverized rock sugar one ounce: mix, and suck a teaspoonful every little while.

Item: of syrup of squash or violets two ounces, of spirits of sulphur two scruples: mix.

Item: of cultivated honey and cold expressed oil of almonds each two ounces; incorporate with the yolk of an egg.

Item: of syrup of diacodion one ounce, of cane syrup two ounces, of sperm oil one dram: mix.

Item: of mucilage of linseed four ounces, of syrup of bananas two ounces, of sweet spirits of niter one dram: mix.

Paregoric drinks

Take of syrup of poppy a half ounce, of aqueous distillate of nightshade four ounces: mix.

Item: of the ice [sherbet] of white poppy seeds, and of sweet almonds a half quartile. Sweeten with sugar.

Item: of pimperl [burnet] water six ounces, of syrup of violets a half ounce, of liquid laudanum five drops: mix.

Soothing pectoral ointments

The simple ointments for pain, or of althea, that of Zacarias, or white poplar, with sperm oil, and with frog oil, linseed, violets, sweet almonds, water-lily [?], or the yolks of eggs.

Antipleuritic ointments

Take of white poplar ointment one ounce, of the oil of seven flowers a half

ounce, of the spirits of hart's horn one dram, of finely pulverized gourd a half dram: mix.

Item: of the compound ointment for pain one ounce, of the oil of yolks of eggs a half ounce: mix.

Balsam of Gonzales

Take of the balsams of pleura humana, and of pumpkin, and of the oil of seven flowers and of the yolks of eggs a half ounce of each, of anodyne balsam one dram, of the spirit of sal ammoniac with anise a half dram: mix.

Attenuant applications

Take of the flour of dill seeds and linseeds, of chopped raw onions, and of grated soap equal parts: mass the whole over the fire with cultivated honey, to the end that when a cataplasm it is to be applied warm.

Item: squabs opened down the back and placed on the pain.

Item: the oil of calabash: that of sweet almonds crushed in a mortar or black flint; or this same oil fried with cochineals in a small smelting furnace, or with toasted rushes (cumin plants).

Diluent saponaceous drinks

The decoction of dry cow dung or of the seeds of the long gourd.

Item: of oxymel with calcium two ounces, of infusion of elder flowers a half pound: mix.

Item: of licorice two ounces, or burdock root one ounce, of elder flowers a half ounce, of red poppies three handfuls: boil secundum arte with thirty-six ounces of water, until reduced to twenty-four ounces; filter, and take sweetened with cultivated honey.

Item: The decoction of licorice, root of marshmallow, and linseed.

Item: The decoction of palo mulato.

Item: The decoction of licorice, Mexican sloe-apple, seedless raisins, maiden-hair, and the leaves of chayote and alligator pears, sweeten with caramelized sugar; or that of barley, with infusion of

red poppy flowers and elder flowers, mixing therewith a little oxymel.

Attenuant mulches

Oxymel with calcium: the syrup of the century plant with finely pulverized squill: the syrup of the long gourd with sperm oil.

Item: of the magnum of antiasthmatic pills two drams, of the syrup of althea two ounces, of the balsam of copaiba a half dram: mix.

Item: of syrup of licorice two ounces, of the balsam of sulphur with anise a half ounce, of the extract of licorice two drams, of camphor a half scruple: mix the whole.

Item: of pulverized gum archipin a half ounce, of the syrup of the century plant two ounces: mix.

Item: of pulverized gum-resin one dram, of kermes mineral three grains, of cultivated honey two ounces: mix.

Incidental pectoral pills

Take of sperm oil one dram, of finely pulverized cochineal, squills, and flowers of benzoin a half scruple of each, of balsam of Peru seven drops, of kermes mineral one grain. With sufficient mucilage from the gum of the mangrove tree make two pills, to be taken, sucking one in the morning, and the other at the close of the evening.

What is the extent of originality and acumen displayed by Venegas in his book? These questions can be answered in only a general way. Certainly the text was modeled after classical patterns, though it can not be said to have been an "adapted copy," a translation, or a rearrangement of a similar work. It repeats innumerable ancient medical saws and traditional modes of expression, but Mexican botanical names, and the mention of native American drugs, occur in too many places as an integral part of the text to warrant the

conclusion that they were intercalated into a wholly formed, pre-existing text. Nowhere, except in the preface, and under the heading of lues venerea, does Venegas rise to the point of insisting that "this Treatise of Practical Medicine is founded on Observation and Experience;" or to signalize his own particular observations; though in the preface he stresses the fact that he does not employ "many of the worthless native remedies that are sold at every step with a thousand eulogies." He goes on to say, however, that "he does not omit those [territorially] regional drugs which his experience in practice has shown him should be communicated to Society."

The remedies, formulas, indications, and therapeutic employments, when not classical in origin, were no doubt obtained for the most part from the Mexican physicians and druggists encountered by Venegas during his years of itinerant practice in America; but a not inconsiderable experience and discrimination was evidently exercised by Venegas before he admitted the American exotics into his medicinal armamentarium. Thus, in brief, it may be said that the substance of the book, when not classical in origin, was collected or compiled, and with a modicum of discretion; the choice of material, the arrangement, and the diction are wholly original, though assimilated to classical (aphoristic) forms. Whatever the faults, omissions and naïveties of the text, there is throughout the whole a breath of directness, sincerity and virility.

To Venegas we, today, are as much indebted for his professional and literary industry as were the unwashed Mexican multitudes, "without benefit of Faculty," of over a century and a quarter ago. Such a book is a mirror

speculum of what medical practice was like only two generations prior to the unparalleled *éclaircissement* that came from the clinical application of microscopic pathology, bacteriology, pharmacology, and aseptic surgery. An hour's study of such a book ought to more than repay for the effort, as it should afford the student a much needed datum for an appreciation of what has recently been accomplished, and what remains to be accomplished in our incomparably altruistic vocation.

A bibliography of the book is as follows:

Bastard or half-title page wanting.

Title-page: COMPENDIO/DE LA MEDICINA:/Ó/MEDICINA PRACTICA,/En que se declara laconicamente lo mas until de ella,/que el Autor tiene observado en estas Regiones de/Nueva España, para casi todas las Enfermedades/que acometen al cuerpo humano:/DISPUESTO EN FORMA ALFABETICA/POR/EL Br. Don JUAN MANUEL VENEGAS,/PROFESOR DE MEDICINA./ *Longarum observationum praesidio instructa mens sa-/gax, potissimam curandarum hominum rationem/assequitur.* Bagliv. Prax. Medic.*/CON LAS LICENCIAS NECESARIAS,/MEXICO:/Por D. Felipe de Zúñiga y Ontiveros./M. DCC. LXXXVIII.

17 unnumbered leaves, pages 1-377, rococo end-piece, verso of page 377 has *Erratas* and *Adiciones*; unnumbered leaves carry dedication (two and a half pages), *Aprobacion del Real Tribunal del Protomedicato* (one page) with letter of ecclesiastical censor on verso; *Advertencias a el que leyere este Libro* (six and a third pages) followed by ten lines of weights and measures; (alphabetic) *Indice General* (in two 12½ point columns separated by rule) begins on verso, 19 pages; *Indice de los Numeros*, 2 pages. Pages originally about 18.75 cm. by 13.4 cm.

Bound: Fly-leaf, title-pages and unnumbered pages in nine signets of four pages (with extra leaf pasted to eighth signet); numbered pages in 47 signets of 8 pages, (A)-Aaa, and leaf added to last signet.

Paper: thin, tough, rag.

Typography: typeset headband; section headings in Latin (roman caps) undisplayed, set in body on indent line, followed by Spanish translations in italics; text divided by seriatim spelled out, numbers in italic caps; subheadings in displayed upper and lower case italics. Leading paragraphs of subsections (but not

of sections) have blackface roman initials two lines high. Most under-subheadings in lower case italics in body. Body type is rounded full to slightly expanded, medium fat-faced, Spanish Gothic, approximately 12 point, set solid; column approximately 25 ems wide by 41 picas long.

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 - 1775—First American surgical work: John Jones' "Plain, Precise, Practical Remarks on the Treatment of Wounds and Fractures" (N. Y.).
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3. To the Great Model of Prelates and Ecclesiastical Pastors:
 To the Doctor of Doctors:
 [The Patriarch Legislator of the same Patriarchs:
 [To the most Immovable Column of the Church:
 and favored of the Holy Faith:
 To the most learned physician:
 To the great man before God:
 and well merited among men,
 SAN AGUSTIN,
 Bishop of Hipona
4. Applied for April 2, 1785; granted, June 10, 1785.

JOHN FEWSTER, AN UNPUBLISHED CHAPTER IN THE HISTORY OF VACCINATION*

By DR. GEORGE C. PEACHEY

LONDON

To DR. LETTSOM

HAVING read several of the publications respecting the Vaccine Inoculation and more especially observed what Dr. Pearson have published respecting Dr. Jenner's claim to originality, and well knowing all falls short of the manner how it came into practice, I was induced to draw up the Narrative herewith sent and lay it before thee, who, from what I have read which have been ushered into view by thy means, appears to me to be desirous of investigating truth and disseminating useful knowledge. Had it been my lot thirty-four years ago (i.e. 1768) to have known Dr. Lettsom when I was deprived of my highly valued friend, Peter Collinson,¹ with whom a literary correspondence had been maintained for some years on various subjects in Natural History and Fossil researches, whose last letter to me was dated May 1768, informing me of his going into Essex to a visit to his Son-in-law Cator's, it would have been a gratification I now think, would have afforded much pleasure to me. But as this was not the case, perhaps by the wise ordering of Providence in order for my mind to pursue more useful things, I must not regret it, and since it has been consistent with the will of Providence about 4 years ago to permit me to be affected when riding against a keen easterly wind,

¹Peter Collinson, F.R.S., who died in August 1768, the friend and correspondent of Cadwallader Colden and Dr. Benjamin Franklin.

*Being a letter from John Player of Tockington near Bristol to Dr. Lettsom with explanations, notes and comments. From a volume of letters addressed to Dr. John Coakley Lettsom (1744-1815), at the Royal Society of Medicine, London.

by its action on my lungs so as to bring on inflammation to a high degree in less than three hours, which after some time gave way to regimen principally, and terminated with a fit of gout in the extremities but left me in so debilitated muscular state to this day; Yet I now enjoy a good state of health having a good appetite, sleep sufficient, and enjoy a tranquillity of mind, my memory being greatly revived and have my mental faculties wonderfully preserved to me. And not being able to go much out except to meeting I employ my time in committing to paper many events which may be in future of utility of which the detail herewith sent thee is a part. I know not why I have given this detail to a man to whose person I am a total stranger, except that of the propensity natural to age of being communicative, and therefore should what I have now sent be so esteemed I hope thy better judgment with Dr. Lettsom's candour will excuse,

Thy respectful friend, John Player.
Tockington, near Bristol,

11 mo. 1. 1802²

I wish to remark that John Fewster is totally unapprised of this narrative herewith sent, nor do either himself or any other know anything of it, therefore I must trust to thy judgment what (if anything) may be best to do respecting it—And be that as it may I was willing to send it for thy perusal.

² Addressed on back to Dr. John C. Lettsom, Camberwell, London. (No postmark.) (Endorsed) From John Player, Nov. 1, 1802, Tockington.

NARRATIVE OF THE DISCOVERY OF THE
COWPOCK AS PRESERVATIVE FROM AND
APPLICATION TO PREVENT INFECTION
FROM THE SMALLPOX: COMPILED FROM
THE CRANIUM PORTFOLIO OF RURICOLA
GLOCESTRIS BY HIMSELF

Every promoter of good work must feel no small gratification when he perceives that the Discovery which he has been cherishing produces effects agreeable to his wishes. (Dr. Lettsom's Hints, vol. 2.)

It may not be altogether improper as introductory to the following narrative to remark that the hieroglyphic of what is called the sacred cow by Dr. Lettsom in the front of his "Account of Vaccine Inoculation" is by no means dissimilar to the subject to which it is prefixed; since it may be understood from ancient history that some of the descendants from Japhet brought knowledge from Asia into Europe and that their passage over the Hellespont was the way they came, whether on the back of the Cow or in the belly of a boat is not necessary to inquire. But it may now be asserted that in the belly of a ship and by means of a cow many ages after this transportation into Europe, the descendants from Japhet carried back into Asia the knowledge of the greatest discovery ever made for the preservation of the human race from the effects of the most destructive disease to which they were liable, the smallpox. This discovery having insured safe and certain prevention by means of the inoculation, first from the cow and afterward from one person to another, a disease no other animal but the cow has yet been discovered to be liable to, which is the cowpocks. I wish to make a short remark respecting the hieroglyphical symbol. It is well known by antiquarians that the chronicle of events worthy [of] preservation were recorded by the ancients by symbols of hieroglyphical resemblance; hence what is called the sacred cow was devised to perpetuate the greatest event we have any record of which ever happened since the Creation—the Deluge or Noah's Flood.

I have never understood any well founded cause to believe that the dividers of this hieroglyphic at first intended it to become an object of adoration, but rather to preserve to futurity the remembrance of the objects by which Noah and his family were preserved from perishing during so tremendous and perilous [a] situation. To illustrate this sentiment it is necessary to observe that the semilunar mark on the side of the cow was not to signify a crescent but a semblance of the ark in which Noah and his company were, and as there was no occasion to guide this floating asylum there is no representation of a rudder and therefore each end formed alike and constructed in such form to prevent dipping under water when descending from the top of a wave which might be raised by the wind on so large [an] expanse of water. And this form is still preserved by the Celtic race, in Wales, in their Crucles [coracles] or leather boats, now used for fishing and for passage in their rivers, and from which it may not seem uncandid to presume the construction of the modern lifeboats was taken. Hence the form of the Ark was retained as the means by which they were preserved, and the form of the cow as the animal by which they were sustained during their imprisonment in the Ark by the milk of the six cows with them and as this food needed no kind of culinary preparation, fire was unnecessary, for it does not appear they had any in the Ark or direction to prepare fuel for it, and the milk these six cows produced might be a supply sufficient for the eight persons in it without the other clean beasts that produced milk also, and why not one of these other beasts were to be retained in remembrance was I think because they had but two teats and therefore more liable to be deprived of the means of producing milk than the cow which had four. It is I believe a truth in animal history that no animals have four teats or nipples but that genus of which the cow is the prominent species, and the

milk is furnished to each teat by separate milk vessels, so that should either teat fail the others are not affected. Hence the cow as sustaining and the Ark as preserving was a proper hieroglyphic to perpetuate the event of as well as the means of preservation during the Deluge. Though when in after times objects of sight were considered necessary to bring to remembrance the sufficiency of Omipotence (to preserve and sustain the creation and in which Noah and the Fathers obeyed through the belief in the sufficiency) these objects become idols of adoration.

The following statement respecting the discovery of inoculation with the cowpock in order to prevent being infected with smallpox I presume will not be unacceptable.

It is the design of the person who penned the following narrative to bring into view not only how the discovery was made but also that man who first suggested inoculation from the cow in order to try the efficacy of the cowpock in preventing the smallpox and also the man who prompted to try the experiment of conveying it from one human being to another and in order to do this in the clearest manner it will be necessary to look back to the year 1760.

At the conclusion of the war which existed when King George the third ascended the British throne, during which the militia of most of the counties was raised and embodied for actual service within Great Britain, amongst which Gloucestershire was one, the North battalion of which commanded by Norborn Berkeley Esq. afterward Lord de Botetourt was marched to Winchester and there encamped to guard the prisoners of war in the Old Palace there. To this battalion John Fewster, a native of Stonehouse in Gloucestershire, was appointed surgeon and I think ensign, he having received his knowledge in surgery and pharmacy in the Bristol Infirmary, his aunt being the Matron of that charitable institution,

and was the first who was appointed to that important office in the then newly instituted charity. Her nephew with much attention and rectitude fullfilled his apprenticeship to the apothecary of the Infirmary, by which means he had opportunity to improve in the Science of pharmaceutic art in a more ample manner than any other young man in Bristol engaged in the like pursuit. And when newly out of his time when the militia was imbodyed was recommended as a fit person to fill the station to which he was appointed, and the which he did to satisfaction, may appear in the sequel of this narrative. When the war was ended and the militia disembodied young Fewster was then to look for a situation in which there might be a prospect of success so as to support himself in an appropriate character. Fortunate for him an opening presented in the town of Thornbury in Gloucestershire, which he immediately embraced, and his success proved the rectitude of his situation. Soon after his settling in this town the Suttonian Inoculation for the prevention of infection from the verulouse (variolous) smallpox was discovered, and the credit of that method became in a good degree established. And he apprehending an opportunity presented of extending his practice, as well as being more generally useful to the community, proposed to some medical neighbouring practitioners the opening an house for receiving persons to be inoculated, which proposal was adopted by Joseph Wallis of Avening, near Tortworth, Hugh Grove of Thornbury and himself, and they procured and opened a large house, then void, at Buckover, near the 13 milestone from Bristol to Gloucester. But before this he had proposed an association of medical men to meet once a month, and dine alternatively or in rotation at each member's house, and at each meeting to make known to each other the cases come to their separate knowledge and the manner of treatment with the success attending, and also to purchase new

publications on medical subjects. The first members of this Institution were Joseph Wallis before named, Edward Jenner of Berkeley, Daniel Ludlow of Sodbury and the proposer John Fewster who also was elected treasurer and librarian to this new institution. And after some time they were joined by some others, and finding the number increase, as well as distance from each other, it was agreed to meet at some place as nearly central as might be got, and in consequence the Ship Inn at Alveston, at the 10 milestone from Bristol towards Gloucester, was fixed on, where this little Society met till the reduction of their numbers made it necessary to discontinue this laudable design. Having made this digression from the subject in order to throw some light on the abilities of the object to be brought into more conspicuous view. I return to the subject of Suttonian Inoculation, now carrying on at Buckover with great success, a great number embracing the opportunity of being discharged from the painful fear of the smallpox. And as this house was in the center of a dairy country many in that employ were patients in the house, amongst whom in the year 1763 were two brothers of the name of Creed, from Hallen in the parish of Henbury, who had here both undergone the operation but not with equal success, for the one received the infection, the other did not, on which he was inoculated a second and a third time but still to no effect. It was the practice of the Surgeons of this house for some, or one to attend every day, and it so happened that after the last time of inoculation of this patient, a proper time being elapsed in which infection might have appeared, that Joseph Wallis met John Fewster there, who, on seeing the appearance of his arms, interrogated him respecting his having at some time or other had the smallpox, to which, after pressing him to recollection, he in a tone of displeasure said—"I tell you I ha'n't had the small-

pox, nor the great pox nither, but I have had the cowpox." Before this neither of the surgeons had any knowledge of the cowpox being a preventative of the smallpox; on which Fewster says to Wallis—"Do you hear and observe this?" Having made this discovery and as it was the day on which these two with their other associates were to dine together at Avening at the house of Joseph Wallis on a haunch of venison presented them; after dinner this discovery became a subject of conversation, it being to them a new discovery. From this time Fewster and Jenner became more attentive to the circumstance as did Wallis, but the discovery thus made lay dormant for several years, during which period Wallis dyed and Jenner obtained a diploma as Doctor of Medicine which consequently took him from manual practice. But having a nephew now introduced into practice, on his becoming in a more exalted situation, such aid was given him as merit deserved, so that the discovery of the power of the cowpocks rested pretty much with Fewster, who with contented assiduity pursued the practice of medicine midwifery and surgery in a district of about five or six miles distance each way from his habitation in Thornbury with great reputation and great success, and in the course of practice in a medical line, was in the month of March 1796 called in by the writer of these memoirs to visit his eldest son, ill of a fever.

I shall now make a little digression in order to throw more light on the subject. As I had been from my childhood brought up in the farming and dairy business, I had seen the cowpocks more than once in the dairy of my father, and several times in the dairy of my neighbours, and had made some observation thereon. And having found that to alleviate the painful heat of the udder of the cow in the advance of the disease after infection and to forward suppuration, that the ointment of marshmallow rubbed on

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morning and evening was the best remedy and that ointment of Nutritum³ was successfully applied when the pustules broke and began to discharge a lymphid matter. But at this time nor till a few years ago (I) knew nothing of this disease, when taken by the milker from the cow, was a preventative of the smallpox, until the opening of the year 1791, when I kept only seven cows, the disease broke out in the udders or teats of first one and then another and then a third. At this time my dairymaid who then lived with me had not had the smallpox and a boy who cleaned and looked after two horses assisted the maid in milking. It was the common practice for the girl to milk four and the boy three of the cows, and mostly each milked the same [cows]. It was those which the boy milked that had the disease, the four milked by the girl escaping it. But the teats of those which had the disease becoming very sore the cows grew uneasy with milking, and the boy being rather fretful, sometimes used them roughly, on which account the maid being more placid milked these after she had milked the other four, by which means she received the infection of the cowpock which was first discovered by the swelling of the glands at the armpit, with a considerable soreness attending it, and a small red spot appearing on her arm-wrist a few days after the swelling under the armpit began, which grew red or rather of a purplish hue till it was formed in its center into a pustule resembling those on the teat of a cow. This pustule increased to near half an inch in diameter and in due time came to a dry scab which when it fell off left a mark which yet remains resembling the mark of the smallpox only larger. I would note that the boy had been some years before inoculated for and received the smallpox and was not anyway infected by the cowpock: whether or not this prevented him receiving the cowpock

³ Ung. Nutritum consisted of Litharge of Gold, oil of roses and wine vinegar: it was reputed to "breed flesh and cicatrise ulcers."

I by no means attempt to determine. But that the disease was given to the first cow by him from the heels of one of the horses in the stable which had the Scratches or the Grese in its heel and which was generally cleaned by the boy in the morning before his milking. And I believe that as he was rather of a slovenly turn he did not always wash his hands till he had done milking. I do not pretend to say. Having been more observant at this time with respect to this disease of cowpock I made a pretty general inquiry among the dairy keepers respecting inoculation for the smallpox in their families, and soon found that many persons who had been repeatedly inoculated with others, in their respective families, and some dairymen's wives who had been inoculated with their husbands and children, did not take the disease, notwithstanding they slept with the husband and attend[ed] the children during the process of the disease under such inoculation. And having also made inquiries of persons advanced in life and supposed not to have had the smallpox, if they had ever had the cowpock, and found several so circumstanced but still retaining a fear of the natural smallpox. One of whom is now upwards of sixty years old told me that her father's cows when he lived at Gritnum⁴ near to Wooten Bassett in Wiltshire had the cowpock, and she when a girl was infected with it, and that her father had employed an old man of Brinkworth whose name was Bushel, a farmer and cow leech to dress his cows; who, on seeing the girl with the disease on her hand, said to her—"Mary, you need not be afraid of the smallpox for you are safe from that." Having got such intelligence it was suggested to my mind, after having attentively looked at every account with several others, as before related, whether this disease from the cow could not be made beneficial to man by inoculation and eventually extirpate the smallpox. Under this idea I

⁴ Grittenham.

suggested my observations to John Fewster one day when he came to visit my son about the middle of the third month 1796: he confirmed by several instances which had come under his notice the truth of its preventive faculty; as before related, I suggested to him the trial on some person either by consent or under disguise as the smallpox, as long observation had confirmed the progress of the cowpock to be safe and with little or no confinement, and that all preparation or medicine was unnecessary. For it seemed to me that the time was come now to make this discovery useful, and that nothing could induce him not to try an experiment except that of its succeeding would ruin the practice of inoculation with the Verulent kind, for that should the cowpock succeed every woman might do it to her child without risk. And added [that] I believed him to be of a too general philanthropic principle as to let any such sinister view bias his judgment. His reply was the idea had struck his mind forceably, but he had not as yet ventured on the experiments, and further said [that] he had spoken to Dr. Jenner years ago on the subject but nothing had yet been done. Here further conversation ended between us, but soon after I found that J. Fewster had given the cowpock by inoculation from a cow to three children of the name of Hodges, in the town of Thornbury, all of whom had the disease. And some time after [he] inoculated these children with the verulent kind but, though this slightly appeared without sickness, it died away on all of them. After this trial and success he communicated the account to a gentlewoman at Tockington of extensive philanthropy, who told him if he would extend his discovery to the children of the poor in her neighbourhood, she would pay him for his doing it. In consequence of this a great number received the cowpock which proved effectual against the smallpox, notwithstanding several of them were afterwards inoculated by his son with it, at the

request of this gentlewoman, under his father's direction.

During the time of this process Dr. Jenner's pamphlet appeared, by which the experiment of this new discovery was made public. It is not intended to depreciate or anyway take from Dr. Jenner the merit due to him, as much is his due, since he that extends the knowledge of any great discovery deserves more than he who discovered a hidden thing and keeps such knowledge to himself. How far Fewster might have made his discovery known had he not been anticipated I do not pretend to say; or whether what Dr. Jenner did was or not with the knowledge of his colleague and sure friend Fewster do I pretend to determine: my sole view being to trace the discovery of this grand arcanum which as it has now become so extensively known will, agreeable to my hint to Fewster, no doubt prove a blessing to millions if not the means of eradicating the smallpox.

7-8-1802 i.e. July 8th 1802.

The foregoing was wrote before my seeing any publication on this subject except Dr. Jenner's first pamphlet, and since my committing to paper my recollection on the subject, for I kept no minutes, I have read the Dr.'s letter to Drs. Marshall and Walker in Walker's "Fragments, etc." also the Report of the Committee of the House of Commons on Dr. Jenner's petition for a gratuity as discoverer, and do not find any evidence advanced which anyway invalidates my account as before stated.

10-30-1802 i.e. October 30th, 1802.

Having had the success of this discovery much at heart and being by disability prevented from corporeal pursuits, my mind have been turned towards subjects which eventually may be beneficial to man, hence arose the foregoing memoirs, and in order to extend observation further respecting what might yet result from Vaccine Inoculations I have attended to the subject of measles under an

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idea that this inoculation was not only a preservative from the smallpox, but also from every other disease communicable by contact. It is now about three years since inoculation with cowpock became in this neighbourhood an extensive practice, many of the subjects of it being children from one to seven or eight years old. About four or five years ago the measles was here very prevalent, and before that time did frequently appear, but since this inoculation have been so much extended I do not remember to have heard of one instance of this disease appearing. I communicated this hint to my friend John Fewster, and also to his son, they determined to make attentive observation. And as further attention is paid to it my idea will soon be proved to be well or ill-founded, and should it prove a preventative in the measles also, may it not be so also to venereal taint, since this disease is communicated by contact as well as the others? I am sensible I make those remarks to a man eminent in professional and scientific knowledge, but as great effects often proceed from small causes, something may grow from these hints beneficial to man should they be of such materials as can bear expansion.

I would further say that should it be ever deemed proper to erect anything permanent to perpetuate the discovery of vaccine inoculation, would not a statue representing Dr. Jenner standing on the back of the cow of the long-horned kind, as the cow from which it was taken was of that species, with a lancet in his right hand inserting the icor into the human arm held by the left hand in the attitude proper to the process. This I think is all which should be most prominent respecting him. But as there were others more attentive to and active in the discovery, so as to its being brought into general use, a bas relief on a panel in the front of the base of the pedestal should represent Dr. Jenner graising up⁵ from an obscure place near the walls of

⁵i.e. arising.

Berkeley Castle, by the assistance of J. Fewster supporting him, who should have the right hand of a man issuing from behind a curtain joining in the effort and prompting thereto.

And underneath 1796, the year the experiment was first made with confirmed effect from one human body to another.

NOTES AND COMMENTS

By way of comment upon the foregoing narrative I propose in the first place to summarise our somewhat scanty knowledge of John Fewster and others who are mentioned therein. A native of Stonehouse, Co. Gloucester, the first we know of him is that by the influence of his aunt who, it seems, had been appointed the first matron to the Bristol Infirmary at its institution in 1737,⁶ he was apprenticed to the apothecary of the hospital and thus acquired a more than usual knowledge of surgery and pharmacy. When newly out of his term of apprenticeship he was recommended for the appointment of surgeon to the northern battalion of the Gloucestershire Militia, then stationed at Winchester. At the conclusion of the war (1763) the militia was disembodied and five years later Fewster, then in search of an opening for practice, settled at Thornbury in his native county. His doings in the interval have escaped notice. Meanwhile Robert Sutton, who was practising surgery and pharmacy at Debenham in Suffolk, had acquired great celebrity for his new method of inoculating the smallpox. The history of the Sut-

⁶The Bristol Infirmary was opened for the reception of patients in December, 1737, and was the second hospital in the provinces to be established on the volunteer subscription principle. Westminster Hospital was founded in London in 1719, and Winchester led the van in the provinces in 1736.

tonian method, interesting though it be, cannot be described here at length, suffice it to say that its novelty and the success which attended it attracted public attention and secured its adoption over a very large area, especially in the eastern counties.

Some few years later Daniel Sutton, one of Robert's sons, who had entered the medical profession, devised a still more novel plan by which the time of preparation for treatment was shortened from a month to eight or ten days and instead of being confined to the house the patients were ordered to walk out in the cold air during the whole progress of the distemper. It was an application of the cool regimen advocated by Sydenham.

Though condemned by the father as not only rash and absurd but extremely dangerous, the son's scheme engaged the favour of the public; a quarrel occurred between them and they parted company. In 1763 Daniel Sutton opened a house at Ingatestone in Essex, his elder brother Robert had established himself as an inoculator at Bury St. Edmund's, and at the close of his first year he had earned 2000 guineas, and his fame had spread to the most distant parts of the kingdom. In 1767 Daniel Sutton removed to London and set up two houses, one at Kensington Gore and another at Brentford. But whereas in the three years at Ingatestone he claimed to have inoculated nearly 14,000 persons, and his assistants another 6000, of whom he averred that no single patient had died "fairly" from inoculation, after his removal to London his practice fell off and the two houses were soon abandoned. But many others had adopted Daniel Sutton's method with success and among them Sir George Baker, who

wrote, in 1766, that "of 17,000 persons thus inoculated no more than five or six have died."⁷

In a letter written by John Fewster in 1798, which is further mentioned later, he states that in the spring of the year 1768 he went to live at Thornbury where he had resided ever since. In that year he with Mr. Hugh Grove, then also practising there, formed a connection with Mr. Sutton and together they took a house at Buckover, for the purpose of inoculating with smallpox. On comparing this statement with Player's narrative, we learn that Joseph Wallis, of Avening near Tortworth, was also joined in the venture, and that it was a large house near the 13th milestone from Bristol on the road to Gloucester.

About this time (1768) Fewster proposed an association of medical men who engaged to meet once a week and dine alternately, or in rotation, at each member's house, and at such meetings to make known to each other the cases which had come to their separate knowledge, the manner of treatment, with the success attending and also to purchase new publications on medical subjects. The first members of this association, says Player were Joseph Wallis before-named, Edward Jenner of Berkeley,⁸ Daniel Ludlow of Sodbury, and the proposer, John Fewster, who also was elected treasurer and librarian. After some time these were joined by others and finding the number increase, as well as the distance from each other, it was agreed to meet at

⁷ Baker, George. *Inquiry into Methods of Inoculating the Smallpox*, Lond., 1766, p. 22.

⁸ It would seem then that Jenner was a member of the Alveston Society before he left Sodbury for London in 1769.

some place as nearly central as might be, and accordingly the Ship Inn at Alveston, at the 10th milestone from Bristol towards Gloucester was fixed on, where this little society met till the reduction of their numbers made it necessary to discontinue the laudable design.

On turning to Baron's "Life of Jenner" we find further details of this association, among the members of which are mentioned Edward and Daniel Ludlow of Sodbury, Shute of Winterbourne, Bradford of Frenchay, Fewster of Thornbury, Pountney of Hensbury, Davies of Bristol and Richardson and Taylor of Wotton-under-Edge. This society was still in existence in 1789, but in 1838 the only survivors of the above were Bradford and Taylor, and it appears that this Alveston society had terminated long before that year. Baron says that Jenner used to bring up the reported prophylactic virtues of cowpox at the meetings of this society, but his colleagues, though acquainted with the rumours, had met with cases in which cowpox had failed to give protection against smallpox, and they declined to discuss the subject. Baron does not specify the period to which he is referring.

Player on the other hand relates that in the year 1763, which from Fewster's own statement that he went to Thornbury in 1768 is evidently incorrect, among those who had gone to Buckover to be inoculated with smallpox were two brothers of the name of Creed, from Hallen in the parish of Henbury, who had undergone the operation, but not with equal success. One received the infection, but the other was inoculated a second and third time without result. In

consequence of the third failure the man was questioned by Wallis and Fewster as to whether he had ever had smallpox, and replied with some heat: "I tell you I haven't had the smallpox nor the greatpox neither, but I have had the cowpox." Before this, Player says, neither Wallis nor Fewster had any knowledge that the cowpox was preventive against the smallpox. The same evening they dined with the other associates at Wallis's house at Avening, and after dinner this new discovery became a subject of conversation. Henceforth, says Player, Fewster, Jenner and Wallis became more attentive to the subject. But the discovery was allowed to lie dormant; Wallis died, Jenner obtained a doctorate of medicine (this, however, did not occur until 1792), and gave up manual practice to his nephew, so that the discovery of the power of the cowpox rested pretty much with Fewster. On the other hand Fewster himself must have abandoned the study of the subject if, as Player says, it was his suggestion to Fewster in March 1796, when the latter was called to attend Player's eldest son, that revived the subject to Fewster's mind and induced him to inoculate the three children of one Hodges of Thornbury with cowpox. All of them developed cowpox, but when they were subsequently inoculated with smallpox the disease only appeared slightly without sickness and died away on all of them. Fewster then communicated this fact to a benevolent lady residing at Tockington, who undertook to pay his charges for inoculating with cowpox the children of the poor in that neighbourhood; a great number were treated in this manner and resisted further inocula-

²Baron. Life of Jenner, 1: p. 47.

tion with smallpox. Meanwhile, says Player, Jenner published his "Inquiry" and thus made the discovery generally known.

As has already been remarked, Player's statement that it was in 1763 that Wallis and Fewster inoculated with smallpox the two brothers Creed at Buckover is manifestly incorrect, for it is beyond doubt that Fewster did not go to Thornbury until 1768. But even if the incident did not occur till the latter year, when by its means Wallis and Fewster came to the knowledge that cowpox was preventive of smallpox and the subject was brought up the same evening at Avening, there is ground for Player's claim that they were the first medical practitioners to arrive at the substantive principle of vaccination. Furthermore it may have been that the discussion at Avening that evening first suggested to the mind of Jenner, then serving his apprenticeship to Daniel Ludlow of Sodbury, for he did not go to London as John Hunter's pupil until 1769, the idea which was elaborated thirty years later in his "Inquiry."

It has been accepted that the first vaccinations with the object of giving protection against smallpox were performed by Benjamin Jesty, the Dorsetshire farmer, upon his wife and two sons in 1774. And even Player, in his endeavour to secure for Fewster a claim to priority, does not date the actual performance of vaccination by him until "soon after" their conversation in March 1796, when Player heard that Fewster had vaccinated the three Hodges children of Thornbury and had subsequently satisfied himself that inoculation with smallpox produced no effect upon them.

It will be remembered that Jenner carried out his first vaccination with cowpox on James Phipps on May 14, 1796, and that subsequent inoculation with smallpox produced no effect. Owing to the disappearance of cowpox from the dairies in his neighbourhood, he had no further opportunity of pursuing his investigations until the spring of 1798, on June 21 of which year he published his "Inquiry." In his pamphlet published in 1801,¹⁰ he says, "My inquiry into the nature of cowpox commenced upwards of 25 years ago"; that would take him back to 1776. If Player is correct the inoculation of the brothers Creed at Buckover, and the meeting at Joseph Wallis's house at Avening, when the new discovery was discussed for the first time, had taken place eight years earlier.

In his "Life of Jenner" Dr. Baron writes:

As it has often been asserted that the late Mr. Fewster of Thornbury has a claim to be considered as the inventor of vaccination, I take this opportunity of saying a few words on that subject. He was associated with Sutton, and was a member of the Alveston society. The subject was often brought before the meetings, but neither this circumstance nor his own previous acquaintance with the reports of the country and his experience that they were not altogether without foundation could induce him to prosecute his investigations further or to countenance Jenner's efforts. On the contrary he certainly undervalued them and continued to do so after the "Inquiry" was published. There are letters from Fewster to Jenner now (1838) in existence which clearly assign all the merit to Jenner without in the most remote degree alluding to any pretensions of his

¹⁰ Jenner, Edward. *On the Origin of Vaccine Inoculation*, 1801.

own. I had a letter in Fewster's name from his son, dated September 3, 1823, after Jenner's death, in which he put forward no claims.

The present location of these letters is unknown, but one of Fewster's letters, dated at Thornbury, October 11, 1798, four months after the publication of the "Inquiry," was printed by Dr. George Pearson in November 1798.¹¹ Unfortunately it is only given in abstract but that abstract is important, if only for comparison with Dr. Baron's statement:

In the spring of the year 1768 I came to live at Thornbury where I have resided ever since. In that very year, from the following occurrence, I became well acquainted with the disease called cowpox. The late Mr. Grove and myself formed a connection with Mr. Sutton, the celebrated inoculator; and to inoculate for the smallpox, we took a house at Buckover. We found in this practice that a great number of patients could not be infected with the smallpox poison notwithstanding repeated exposure under most favourable circumstances for taking the disease. At length the cause of the failure was discovered from the case of a farmer who was inoculated several times ineffectually, yet he assured us he had never suffered the smallpox, "but," says he, "I have had the cowpox lately to a violent degree, if that's any odds." We took the hint, and on inquiry found that all those who were uninfected had undergone the cowpox. I communicated this fact to a medical society of which I was then a member, and ever afterwards paid particular attention to determine the fact. I can now with truth affirm that I have not been able to produce the smallpox in a single instance among persons who have had the true cowpox; except a doubtful case which you are acquainted with. I have since that

¹¹ Pearson, George. *An Inquiry Concerning the History of the Cowpox*. Lond., 1798, p. 116.

inoculated near 2000 for the smallpox amongst whom there were a great number who had gone through the cowpox; the exact number of these I cannot tell, but I know that they all resisted the infection of variolous matter.

With regard to your questions:

1. As to danger from the cowpox. In the course of thirty years I have known numberless instances of this disease but never known one mortal or even dangerous case.

2. Is a person susceptible of the cowpox more than once? I cannot answer this question.

3. Is the cowpox in the natural way a more or less severe disease than the inoculated smallpox? I think it is a much more severe disease in general than the inoculated smallpox. I do not see any great advantage from inoculation for the cowpox. Inoculation for the smallpox seems to be so well understood that there is very little need of a substitute. It is curious, however, and may lead to other improvements.

4. Have you ever known any pregnant woman labour under the cowpox? Yes, many, but it has never produced abortion. The state of the foetus I cannot speak of.

5. Are cows affected at certain times more than at others? They are especially affected from February to May, when there is the greatest number of greased horses.

I cannot procure any cowpox matter this season.

It is no intention of mine to impugn Dr. Baron's honesty of purpose in endeavouring to claim for his friend Jenner the sole credit of having been the means of introducing vaccination with cowpox as a protection against smallpox to the medical profession. But when he states that Fewster unquestionably had no just claims as an investigator and discoverer in this field, he forgot or was unaware of

Wallis' and Fewster's discovery, in 1768, of the protective power of cowpox against smallpox, which was then for the first time substantiated by them to their brethren of the Alveston society. And it appears not unlikely that Jenner was himself present on that occasion, and then and there, formed the determination to investigate the subject for himself.

Baron stresses Fewster's opinion that the cowpox in the natural way was a much more severe disease in general than the inoculated smallpox, and that, as the latter seemed to him to be so well understood, there was very little need of a substitute. Fewster had himself been inoculating for at least thirty years by the Suttonian method which, on the authority of no less a person than Sir George Baker, had been followed by no more than five or six deaths out of 17,000 inoculations. With the experience of himself and others before him it was not unnatural that he should prefer the older and better proven method. But he realised that vaccination with cowpox might lead to other improvements; and in any case it re-

mains to his credit that Wallis and he were the first medical practitioners to substantiate the protective immunity to smallpox conferred by cowpox in the natural way.

In his letter to Lettsom, a fellow member of the Society of Friends, Player denies any intention to depreciate the merit due to Jenner for extending the knowledge of the discovery; his avowed object was to trace the history of the discovery itself. He takes credit to himself for having revived Fewster's interest in the subject in March 1796, and in a subsequent letter to Lettsom he states that Fewster knew nothing of the narrative which he, Player, had compiled. He left it to Lettsom to decide what use, if any, should be made of the narrative and the information it contained; and in the result, while Lettsom, so far as has been discovered, did not see fit to publish it, he deemed it worthy of preservation. It was found by chance by the present writer among other manuscripts in a bound volume bearing Lettsom's bookplate in the library of the Royal Society of Medicine.



A MEMORIAL GROUP OF THE HARVEY FAMILY [1549-1661]

By SIR D'ARCY POWER, K.B.E., F.R.C.S.

LONDON

THIS memorial group of the family of which William Harvey was the most illustrious member occupies one wall of the drawing room at Rolls Park, Chigwell, Essex. I am indebted to

The center portrait is undoubtedly Thomas Harvey (1549-1623), the merchant and jurat of Folkestone. On his dexter (apparent left) side in order from above downwards are: (1) William Harvey (1578-1657), the discoverer of

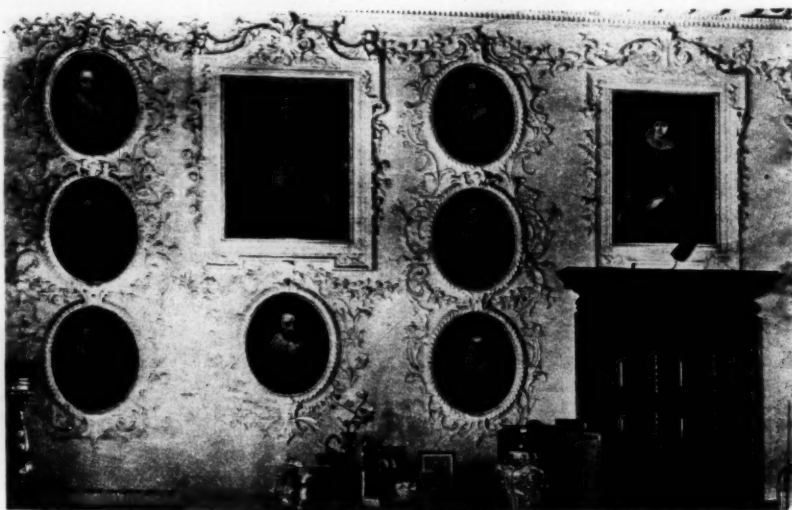


FIG. 1.

Lady Lloyd, widow of Lieut.-General Sir Francis Lloyd, G.C.B., a direct descendant through his mother of Eliab Harvey, for permission to use it. The room was built by Eliab Harvey about 1700 and one wall was designed to show the portraits of his grandfather, uncles and aunt. The portraits, painted in oils, must not be looked upon as likenesses. They were painted at the very end of the seventeenth century, perhaps from preexisting portraits, but they were sufficiently like the originals to pass muster with a second generation.

the circulation of the blood; (2) John Harvey (1582-1645), "footman" or, as he would now be called, equerry to King James I afterwards member of Parliament for Hythe; (3) Thomas Harvey (January 1584-85?-1622), merchant, trading with Turkey. On the sinister (apparent right) side are: (4) Daniel (1587-1649) also a Turkey merchant who lived at Combe near Croydon in Surrey. Dr. William Harvey, in his old age, used to stay with this brother and rest himself on hot days in the "caves" on his estate. Below him is (5) Eliab (February

1589-90?-1661) who was, like his brother Thomas, a merchant prince trading with Turkey. He is said to have managed all William Harvey's financial affairs to the latter's very great advantage. He bought Rolls Park and built the memorial chapel at Hempstead. Below him again is (6) Michael Harvey (1593-January 1642-43?), the twin brother of Matthew (1593-1642), both Turkey merchants. In a separate panel is a lady, sometimes said to be Mary, the wife of Sir Eliab Harvey. It is evident, however, that she is wearing a dress of the same period as the rest of the family so that she is probably Amye (1596-1645?), the only daughter of Joan Halke and sister to the men of the family. She married George Fowke in 1615 and was the mother of children, but beyond this nothing is known of her.

The group is interesting for the Harvey family were as remarkable for their mutual affection as for their quick tempers. William Harvey, even when he got old and irritable, found a warm welcome with Daniel and Eliab and his will shows that he wished every member of the family even down

to his godchildren to have some souvenir, no matter how small, by which he might be remembered. The quickness of temper seems to have been an abiding characteristic. Three generations later there is a letter extant from Lady Harvey, wife of Nelson's captain, to her daughter saying: "Dear Louisa: What did you write to your father this morning? As soon as he had read your letter he went up to his dressing room where he spent the morning in kicking his wig about and using that nautical language with which you are so well acquainted."

It is a great satisfaction to have obtained a good photograph of this group whilst the portraits are still undamaged and are in their original setting and a great debt of gratitude is owing to Lady Lloyd for it. Rolls Park, sixteen miles from the Bank of England, which was once far away in the country, is now becoming engulfed by London and omnibusses pass its gates. There will come a time, and that soon, when the speculative builder will put villas and bungalows in its place and then what will happen to the wall with the portraits?



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[From Schenckius: *Observatonum Medicarum*, Francofurti, 1609.]

EDITORIAL

HYGIENE IN THE MIDDLE AGES

Lynn Thorndike (*Speculum*, April, 1928) comes to the defense of the Middle Ages in the matter of hygiene and sanitation. He shows among other things that some medieval towns maintained communal salaried physicians to give free medical advice to the poor. Hospitals also existed in the middle ages, and counterparts can be found for many other so-called modern philanthropic institutions.

As for sewage disposal, the Middle Ages could scarcely have shown worse conditions than prevailed in England up to nearly the middle of the last century. In 1844 a royal commission found only two towns in which refuse was removed at the public expense from the courts and alleys of the slums. During the same period 300 London sewers emptied themselves into the Thames above the lowest intake of the water companies.

Back in 1550 when Henry II of France proposed to turn some of the sewers of Paris into the Seine the municipal authorities vetoed the suggestion on the ground of the danger to the public health, since nearly half the population of the city was dependent upon the river for water for cooking and drinking purposes.

It has also been charged against the Middle Ages that soap and baths were little used. But inasmuch as the belief was general that low forms of animal life, worms and flies, were generated spontaneously from dust and dirt, it is reasonable to suppose that medical men would object to having filth upon the streets or allow dirt to collect upon their own persons.

Such a posteriori argument would, however, have little force were it not supported by facts. Baths were in widespread use in medieval towns. In the fifteenth century Mainz had 4, Frankfurt, 15 public baths with paid bath-keepers. In the next century we find 13 at Nuremberg, 17 at Augsburg, and 29 at Vienna. There may at times have been a sensual side to bathing as emphasized by Boccaccio but that should not obscure the fact that the primary purpose of the baths was cleanliness. Mineral baths were from time immemorial much frequented by health seekers.

Thorndike makes out a very good case for the Middle Ages and adds another stone to the edifice of rehabilitation in the erection of which American scholars, particularly men like Haskins, have had such a large share.

DAVID RIESMAN.



BOOK REVIEWS

FROM MAGIC TO SCIENCE, ESSAYS ON THE SCIENTIFIC TWILIGHT. By Charles Singer. London, Ernest Benn, Ltd., 1928.

Students of the history of science will hail this volume in which the author reprints seven essays on the subject which have most of them been heretofore accessible only in the original transactions of various societies to which they were contributed. One, the "Visions of Saint Hildegarde," was contained in the first volume of Dr. Singer's invaluable "Studies in the History of Science," which has become very difficult to obtain because it is now out of print. The very valuable essay "The School of Salerno and its Legends," in which Mrs. Singer was an active collaborator appeared in *History* in 1925. Although very short this essay has been a great factor in clearing up much of the mysterious glamour which has done so much to obscure the true history of that ancient school. As Dr. Singer says these essays represent the continuous development of a single line of thought and it is a great advantage to have them grouped in a single volume. His object has been to give a true and unbiassed picture of medieval "science" and he shows how often out of the welter of ignorance and superstition which prevailed during the middle ages, magic slowly gave way before the first glimmerings of science while gently reproving the medieval enthusiast who would have us believe that the learning and culture of those days was comparable to our own. He shows what that learning and culture really amounted to by presenting some of its best products for our consideration, from which we learn that the "knowledge of the day was not only perverted and corrupt in quality but that it was also extremely small in extent."

In "Science under the Roman Empire"

Dr. Singer gives a most discriminating analysis of what were the real achievements of the Romans and wherein they fell short of real progress in scientific studies. By a comparison of the characteristics of Greek and Roman art the author shows that while Greek art excelled in idealistic representation, as did Greek science in abstract reasoning. Roman art was marked by closer observation of natural objects and more accurate representation of them. This is manifested by a series of well chosen illustrations drawn from Greek and Roman sculpture. The infiltration of Greek culture into Rome was bitterly contested by many cultivated Romans. Attempts have been made to explain why the Roman did not continue the splendid scientific work of the Greeks after they had conquered Alexandria and were in a position to witness its value. Dr. Singer casts aside the supposition that it was due to the absorption of the Roman mind in conquest and administration, pointing to the fact that this preoccupation did not lessen the ardor of the Roman in the study of philosophy, literature and rhetoric. He thinks that prevalence of the Stoic philosophy, "based on a rigid conception of the interrelation of the different parts of the world, provided little stimulus for the acquisition of new knowledge or for anything in the way of research," was fatal to Roman scientific effort. Dr. Singer reviews all the Roman authors who wrote on scientific topics, Lucretius, Varro, Pliny and Seneca, only to show how void of the real scientific spirit they were. Nevertheless the practical Roman mind led to the establishment of medical schools and even emphasized the importance of veterinary medicine. Also in hygienic matters the Romans realized the importance of proper water

supply and sewage, as the stupendous remains of their aqueducts testify to the present day, and they organized hospitals on a scale far beyond what we might have expected. The essay concludes with a summary of the Roman knowledge of physics, geography and mathematics, which was far beyond their medical science.

In the second essay "The Dark Ages and the Dawn of Science" Dr. Singer places the end of antiquity and the beginning of the middle ages for science at the end of the fourth or beginning of the fifth century and the end of the medieval period at the year 1543, in which Vesalius published his "De fabrica corporis humani" and Copernicus his "De revolutionibus orbium caelestium." Although previous to 1543 there were occasional faint glimmers of the light of a new knowledge these two books were the first to formally reject the old views and introduce entirely new conceptions of scientific methods. All attempts to place the date of the rebirth of science at an earlier period fail because, though Roger Bacon and a few other men were notable exceptions to the general level of mediocrity "the point of view of the eleventh-century encyclopaedist, of the thirteenth-century scholastic and of the fifteenth-century scholar was formally and essentially an effort to return to the past." The revival of learning in the fourteenth century was really an effort to return to the past and practically all its endeavors were directed to a restoration of the knowledge possessed by the Ancients, not an effort to throw new light on the old. The "Arabian Infiltration" began in the tenth century chiefly through the medium of some Jewish writers, who were capable of translating from the Eastern tongues the Greek writings which had been preserved in them after transportation into Asia and Africa by the Nestorian Christians.

In the eleventh century Constantine the African, living as a monk in the Monastery at Monte Cassino translated a

great number of Arabic medical works into Latin, and in the succeeding two or three centuries he had many successors especially among the Jews dwelling in the Arabian caliphate at Cordova and Toledo, and in the schools of Sicily and Southern Italy. Under Arabian influence astrology came to hold the place of prime importance in medieval learning. Dr. Singer gives due credit to the group of men whose activities enlighten somewhat the scientific darkness of the latter part of the middle ages, Nicholas of Cusa, Purbach, Regiomontanus and the great Leonardo da Vinci, but we think he is right in strictly separating the revival of learning and the work of these and a few others from the dawn of modern science ushered in by Vesalius and Copernicus in 1543.

The third essay is a description of "The Lorica of Gildas the Briton." The term *lorica* was applied to a cuirass of leather used to protect the body from injury in combat. Metaphorically it was used to signify a text which would protect the body from injury or disease and the soul from the assaults of the devil or other evil spirits. Dr. Singer tells us that there are six manuscript copies of the "Lorica of Gildas" in existence and he gives us a translation of one which is in the British Museum. It is an interesting illustration of a form of medical practice, chiefly consisting in the repetition of certain religious formula.

The next essay "Early English Magic and Medicine" is closely connected with that on the "Lorica of Gildas" as it deals with various Anglo-Saxon manuscripts illustrating the practice of medicine during the dark ages. From his study of original manuscripts Dr. Singer presents us with an epitome which shows how deplorably low had sunk the dribbles of learning from various Greek, Latin and Oriental sources which had fallen into Anglo-Saxon hands. The many pictures which he reproduces are curiously illustrative of the way the Anglo-Saxon compilers were wont to copy pictures from Oriental or Continental sources and give

these conventionalized pictures the names of native plants. Salernitan texts were evidently the source of some of the medical texts of the Anglo-Saxons. Mixed with Oriental and Continental lore we find much Teutonic mythology and sometimes the latter predominates without the admixture of the other elements.

In "Early Herbals" Dr. Singer gives a fascinating study of the development of what was for many centuries a most important branch of medical knowledge, showing among many other points of interest how successive scribes copying the works of their predecessors gradually conventionalized the pictures of the plants they were supposed to represent and, having no idea of the geographical distribution of plants localized plants in various regions where they never existed. As with anatomy so with botany. It was the great artists of the fifteenth century who first began to draw and paint plants according to nature. There are many pictures of plants and flowers by Botticelli, Leonardo da Vinci and Albrecht Dürer which depict them so naturally that they can be readily identified. In the Bibliothèque Nationale at Paris there is a manuscript, "Book of Hours of Anne de Bretagne," illuminated by Jean de Bourdichon with most wonderful drawings of plants with insects infesting them. Some of these Dr. Singer reproduces and their accuracy is really marvelous. To Otto Brunfels, whose herbal was printed at Strassburg in 1530 belongs the credit of producing the first herbal which relied entirely on its author's observations. In 1542 Fuchs published his "De historia stirpium" which is "the high-water mark of the Renaissance herbal."

"The Visions of Hildegard of Bingen" is a study of the writings of this remarkable female mystic, which with the accompanying illustrations remind one quite forcibly of Blake. Hildegard died in 1179 in her eighty-second year. As Singer says she was probably a hysterio-epileptic and the "visions" in which she presents her views of the macrocosm and

microcosm, show a curious sort of mixture of Aristotelian and Neoplatonian which presents us with the science of the dark ages just merging into the Arabian twilight.

In the "School of Salerno and its Legends" Dr. and Mrs. Singer separate fact from fiction with masterful knowledge and clear-sightedness. The old legend that the School was founded by four masters, a Greek, Latin, Arab and Jew, is shown to be merely a symbolical manner of expression to signify the four currents of thought and teaching which prevailed within it. The famous female professor "Trotula" vanishes before Doctor Trotus, a mere man, whose book on the diseases of women was familiarly spoken of as "the Trotula." Constantine the African is shown to be a stupid and clumsy plagiarist, and the dedication of the "Regimen Sanitatis Salerni" was merely a catchword to obtain popular favor for the work.

The book is copiously and very beautifully illustrated and is in every way a worthy companion to the "Studies in the History of Science" by the same author.

FRANCIS R. PACKARD.

HISTORY OF MEDICINE, WITH MEDICAL CHRONOLOGY, SUGGESTIONS FOR STUDY AND BIBLIOGRAPHIC DATA. By Fielding H. Garrison, M.D., Lt. Colonel, M. C., U. S. Army, Ed. 4, Revised and Enlarged. Phila., W. B. Saunders Co., 1929.

Few tasks are more pleasant to the reviewer than the welcoming of an old friend, more portly in form and, where possible, improved in contents. The fourth edition of Garrison's History of Medicine is not merely a somewhat revised reprint, but a totally rewritten work, with many important additions. Among these we find especially notable the pages which deal with the advances in medicine during the present century. In presenting the essential facts in the development of such branches as endocrinology, roentgenology, parasitology, intravenous therapy, and serotherapy, the Author manifests a familiarity with the

enormous literature which concerns them, and a capacity for presenting the salient facts pertaining to each which is truly astonishing. In matters such as these, there is but little historic material available, and Garrison must have consulted the original writings scattered in many languages, in the pages of widely distributed publications.

This part of the *History* is really a bibliographic guide to twentieth century medical science. This applies not only to the literature of such countries as Germany, France, England and the United States, but the Author gives also the history of the contributions made in other European countries and the Latin American republics. This part of his book is a comprehensive retrospect of twentieth century medicine in all its varied aspects including the various specialities. An interesting account is given of the progress of socialized and state medicine in various countries, particularly Russia. Garrison is evidently awake to the increasing progress of this tendency, and it is well for the profession that its attention should be directed to it.

Like postscripts, appendices are sometimes of as much or even greater importance than the body of a book. There are two especially valuable appendices to the *History*; one on the chronology of medicine and public hygiene, and the other of bibliographic notes on medical history. Garrison begins his chronology with the Neolithic Age and concludes it with the Year of Grace 1928. It includes not only the dates of important events in strictly medical history, but those which are of importance to it from the standpoint of the other sciences, or as landmarks in social or cultural progress.

Too much cannot be said in praise of the bibliographic notes. Classified under appropriate headings these notes furnish the keys to the literature of any subject in medical history which the student may be desirous of looking up.

It is sixteen years since the first edition of Garrison's "*History of Medicine*" was

published, when it at once won the well-earned approbation of its readers. It has become universally recognized as the standard work on the subject in the English language for many reasons. As a work of reference it is beyond comparison the most comprehensive and accurate, whether for biographic, bibliographic or strictly historical information, from the earliest time to the present day. It is also a history in the fullest sense, presenting its particular subject in the setting of the epoch to which it belongs, and showing its relations to it. Instead of a mere recital of details, biographic or historical, Colonel Garrison's book is written in the broadest philosophic spirit, and can accordingly be read with a pleasure far from common in standard books of reference. By condensing mere historical, biographical and bibliographical details into notes in small type, the main text of the book can be read easily as a connected narrative, and it is by such concentration that it has been possible to condense the work into one volume. There is no other work that can be compared with it in English, in fact we know of no other work in any language, except that of Castiglioni in Italian, which in anyway approaches Garrison in inclusiveness of matter, conciseness with clarity of text, and elegance of presentation.

FRANCIS R. PACKARD.

MAKERS OF NURSING HISTORY. PORTRAITS AND PEN SKETCHES OF FIFTY-NINE PROMINENT WOMEN. Edited by Meta Rutter Pennock. N. Y., Lakeside Pub. Co., 1928.

The brief biographies contained in this volume are classified under several headings. In the first group entitled "Portraits from the Past" are included some of the pioneers who realized the need for skilled caretakers for the sick many years before the idea of the modern trained nurse was visualized, such as Louise le Gras and Jeanne Mance, together with those who were the actual founders of the modern system of nurse-training, Fredericka Fliedenr and Florence Nightingale. In the

second group are described the careers of a number of women who were active in the establishment of some of the most important training schools in the United States. In the following sections we find sketches of nurses who were "Pioneers in Public Health," "Leaders in Government Service" and "Authors in the Nursing Field." The last section is entitled "Portraits of Leaders in Foreign Countries." It is a pity that the material at the Editor's disposal has not been utilized towards the construction of a connected story of the work achieved in recent years by the leaders in the nursing profession to serve as a supplement to the splendid book written by Miss Nutting and Miss Dock. As it stands the book is, as the Editor candidly states, merely "a portfolio," of what the reviewer can only consider as journalistic sketches.

FRANCIS R. PACKARD.

THE RÔLE OF SCIENTIFIC SOCIETIES IN THE SEVENTEENTH CENTURY. By Martha Ornstein, PH.D. Chicago University Press, 1928.

The author of this work received her degree of PH.D. in 1913. This was her dissertation for the Doctorate. In the same year she married Dr. Jacob Bronfenbrenner. After two years of happy married life she died as the result of an automobile accident. Twelve years later her friends have published this truly remarkable work as a memorial to her scholarship. As it was written so it is published under her maiden name.

In Chapter 1 the author makes the at first somewhat startling statement that "if the progress of a century is shown by a comparison of the knowledge of scientific facts which prevails in its first and in its last decade, no other century, perhaps, can show strides in the realm of knowledge equal to the seventeenth," and she proceeds to quote Rosenberger's phrase that "it was the task of the seventeenth century to introduce experiment into science and to make the experimental method that recognized in science." This book is a well executed effort to

show just how the great development of scientific methods arose and what were the chief factors in bringing it about in the epoch under consideration. In it arose physical and chemical laboratories, botanic gardens and anatomical theaters and dissecting rooms. Although the latter existed at an earlier time in a few Italian universities, they were practically unknown elsewhere.

The author proceeds to show the difference in the knowledge of two imaginary characters, A and B, the first living in 1600, the latter in 1700, in the various branches of science. In the domain of medicine we certainly must concede the palm of achievement to the seventeenth century. Harvey's discovery, followed by those of Pecquet and Aselli, the use of the recently invented microscope by Malpighi, Leeuwenhoek and Swammerdam, and the work of Willis, Lower and Glisson completely changed all previous conceptions of anatomy and physiology, and overthrew the worship of Galen which had prevailed for fifteen hundred years.

During the first half of the seventeenth century there sprang into existence a widespread interest in the new ideas prevalent in all scientific lines of thought. Galileo invented the telescope, Jansen had made the microscope, and Guericke conducted a number of experiments throwing new light on physics with the airpump which he had devised. These men were followed by a great many individual experimenters and investigators, such as Robert Boyle, Leeuwenhoek, Malpighi, Hooke, etc. It was but natural that sooner or later men interested in the same scientific pursuits should associate themselves in groups in order to get one another's ideas and give mutual aid in their researches. Thus we can easily explain the formation of so many learned societies in the latter half of the seventeenth century. Although wealthy amateurs like Boyle could afford to equip their own laboratories their less fortunate fellows could not purchase the necessary apparatus or pay assistants. On the other

hand the wealthy scientist was stimulated in his zeal in forwarding science by providing his poorer coworkers with the instruments they required and was glad to avail himself of their assistance in turn in his own researches. These needs were well met by the various academies and societies the origins of which are so well described by Dr. Ornstein in the present work.

The oldest of these learned societies were established in Italy. From 1601 to 1630 there existed in Rome the *Accademia dei Lincei*, the Academy of the Lynxes, which in 1609 published the earliest published records of any scientific society. Among its members was Galileo. It was founded by Duke Frederigo Cesi, and his death in 1631 and the condemnation of Galileo in 1633 put a damper on its activities which ceased altogether in 1637. It was succeeded by the famous *Accademia del Cimento*, or Academy of Experiment, founded by Leopold de Medici at Florence. Of this society Borelli, the founder of the Iatrophysical School of Medicine, and Francisco Redi, a poet as well as a scientist, were the best known members, and Nicolaus Steno, the Dane, who gave up his scientific career to become titular Bishop of Titiopolis. When Leopold became a cardinal in 1667 the *Accademia* was given up. Their published transactions were distinguished by the fact that the individual articles were not signed, all of them being put forth as the contribution of the *Accademia* to science, and not as the efforts of any particular members. The Royal Society of London received its charter in 1662, but many of its fellows had been in the habit of meeting as a society in London or at Oxford during nearly twenty years before that time. Dr. Ornstein gives a good summary of these meetings and the men that attended them during this formative period. It is a pity that in this connection we have only such vague knowledge of the "Invisible College" of Boyle, which was undoubtedly one of the factors in the origin of the Royal Society. In addition

to its meetings the Society proceeded to establish a laboratory, a collection of scientific instruments and a museum of natural objects. Its meetings were devoted to demonstrations of experiments in physics, exhibitions of new instruments or mechanical devices and observations in natural history and medicine. An important part of its work was the correspondence carried on by means of its secretary with other scientific organizations or workers in foreign countries. It was by this means that much of the work of Malpighi the Italian, and Leeuwenhoek the Dutchman, was communicated directly to the Royal Society of London. It began the publication of its "Philosophical Transactions" in 1664, and has continued them with but occasional slight interruption to the present day. The Society also published many scientific works, among which we will mention only Evelyn's "Sylva," Hooke's "Micrographia," and Ray's "British Fishes." An essential feature in the foundation of the Royal Society was its complete independence, in spite of its title, of any control or support by any prince or ruler. Charles II was deeply interested in the scientific aspects of its work but never in any way attempted to influence its researches or actions.

The French *Académie des Sciences* had its origin in the meetings of a group of scientists and philosophers who gathered at one or another's houses. Among them were Pascal, Gassendi, Thévenot, Roberval and Perrault. Their meetings attracted the attention of Colbert and he proposed to Louis XIV to organize them into an academy. The King provided them with a place in which to meet and a laboratory and gave them a liberal sum for the purchase of books and instruments. Colbert appointed the original members of the institution thus created and arranged that each of them should receive a pension of 1500 livres. Perrault, like Christopher Wren, was a very distinguished architect. Largely on his initiative the *Académie* undertook a collective

study of zoology and botany which resulted in the publication of two exhaustive works, "*Mémoires pour servir à l'histoire naturel des animaux*" and "*Mémoires pour servir à l'histoire naturel des plantes*." Endowed with ample funds the Académie des Sciences sent forth several scientific expeditions which achieved notable results. Dr. Ornstein summarizes the large number of valuable contributions to science made by the Académie. With the death of Colbert, however, the Académie fell on evil days. His successor, Louvois, ordered them to pay attention to more practical matters and the scientific output fell to a minimum. In 1699, Pontchartrain, who had succeeded Louvois, effected its reorganization and from that time until the Revolution it held its place as a great scientific institution.

The author mentions three German scientific societies which existed in the seventeenth century but encountered difficulties which led to their dissolution after only a few years of activity. The Berlin Academy was not founded by Leibniz until 1700.

Dr. Ornstein concludes her work with a review of the attitude of the universities towards science in the seventeenth century. We must agree with her that they contributed but little to the advancement of science. Many of the greatest scientists of that time held no university position, and those who occupied professional chairs in many instances won fame in spite of rather than because of their university connection.

The universities remained in bondage to their medieval traditions and among scientific men there was a feeling of revolt against this attitude which led to their seeking fields for their activities elsewhere. The scientific societies afforded them opportunities to cooperate with their coworkers, carry on their experiments and pursue their investigations. It was these societies that in time brought about the reform of university methods

which has restored to them their position in the scientific world.

FRANCIS R. PACKARD, M.D.

A SHORT HISTORY OF MEDICINE INTRODUCING MEDICAL PRINCIPLES TO STUDENTS AND NON-MEDICAL READERS. By Charles Singer, M.D., D.LITT. (Oxford), F.R.C.P. New York, Oxford University Press, 1928.

This valuable contribution to medical history deals with the principles or philosophy of its subject more than with historical or biographical details, although enough of these are given to make the narrative a continuous one from the most ancient days in Greece to the present day. Although we are glad that the author has avoided the use of that overworked word "outline" to define his work it is very similar in plan to the many "outline" histories of various forms of human activity which have lately appeared in such abundance. His elucidations of the steps in the progress of medical science deal with the circumstances and collateral events that produced them instead of merely recording them as the products of some individual's ingenuity or intellect. The reader is shown, for example, how Harvey's immortal explanation of the circulation was led up to by the work of many other anatomists without in any way detracting from the glory of his achievement in reasoning out and proving by experiment the truth of his great concept, and he then shows how the missing links in Harvey's chain were supplied by the labors of the microscopists who discovered the capillary circulation. It is to be hoped that Dr. Singer's book will be read by many laymen as well as by physicians and medical students. Many of the errors into which the laity fall as regards the adoption of new cults would be obviated if a knowledge of the principles upon which true medicine is based was more generally diffused. They would know better how to winnow the wheat from the chaff, and cease to follow after strange gods. Careful study of this book

would prepare the mind more easily to distinguish the false from the true and do much to lessen the number of those who fall with avidity for any cult or system which is sufficiently plausibly introduced. The book is copiously illustrated with wisely selected pictures which serve to emphasize the text.

FRANCIS R. PACKARD.

FURTHER CORRESPONDENCE OF JOHN RAY.
Edited by Robert W. J. Gunther, M.A., LL.D., etc. Lond., Printed for the Ray Society, 1928.

This is one of the annual publications by which the Ray Society has for many years rendered such distinguished service to science. Instead of publishing the usual "transactions" as do other scientific societies, thereby spending a great deal of money in reproducing scientific papers in inaccessible form, the Ray Society each year publishes in worthy form a monograph on some topic of natural history. This year the volume is a collection of hitherto unpublished letters of John Ray, the father of English natural history, in whose honor the Society is named. Ray was not a physician but in 1667 he became a Fellow of the Royal Society and thenceforth was in close association with the famous group whose investigations did so much to forward the medical as well as the other sciences of the day. To anyone studying the history of science in England in this most interesting period Ray's letters are of great value. The Ray Society has previously published two volumes concerning Ray: "Memorials of John Ray," published in 1846, and "The Correspondence of John Ray," published in 1848. The letters in the present volume have never been published in extenso, and only a few of them even in abstract form. For many years they have lain undisturbed in the Bodleian Library, the British Museum and among the files of the Royal Society. They deal almost entirely with zoological and botanical topics and are addressed to various correspondents.

Dr. Gunther has edited them in the most scholarly fashion and his brief but appropriate notes are a suitable accompaniment to the correspondence.

FRANCIS R. PACKARD.

THE PEAKS OF MEDICAL HISTORY. AN OUTLINE OF THE EVOLUTION OF MEDICINE FOR THE USE OF MEDICAL STUDENTS AND PRACTITIONERS. By CHARLES L. DANA, M.D., LL.D. Ed. 2. New York, Paul B. Hoeber, Inc., 1928.

This interesting small book by the distinguished New York neurologist and student of medical history emphasizes the high spots in the evolution of medicine. The main facts of medical history are presented with brevity and in proper consecutiveness. The book might well serve as an outline for a course in the history in our medical schools. It would enable the medical student to obtain in a short time a visualization of the subject as a whole, and thus get a background upon which he could work out details in accordance with his interests and tastes. As an aid to the memory the author introduces a diagram with an exposition of the six "peaks" of medical history, commencing with the dawn of history itself to the period of Hippocrates, the period of the Alexandrian School, the period of Galen, the Renaissance period under Vesalius, Paracelsus, Paré, and Harvey, the period of theories and speculations, ending with Jenner, and the period of the arrival of modern medicine covering the nineteenth and twentieth centuries.

Dr. Dana's book contains numerous beautifully reproduced illustrations. Most of these are full-page and printed on special interleaved paper. The author places a special value on those illustrations which indicate medical activities such as operations, medical teaching, etc., illustrations which are *kinetic* rather than static in character, and give a social atmosphere to a text which is preponderatingly biographical.

In the final pages of the book are given some biographical references not only to the special monographs and modern treatises on medical history, but to certain books which have been especially interesting to the author.

Dr. Dana's book is indeed a very worth while volume. It is written in a clear style and is to be recommended not only to those who are desirous of refreshing their knowledge of medical history, but especially to the medical student who desires an introduction to the subject.

ELMER H. FUNK.

CONSECRATIO MEDICI AND OTHER PAPERS.

By Harvey Cushing, M.D. Boston, Little, Brown & Co., 1928.

This volume contains fourteen papers on a variety of subjects. Their author is not only one of the most prominent surgeons of the United States but is also an eminent bibliophile, and has already won literary fame as the author of an outstanding biography, that of Sir William Osler. In the present volume one of the essays is particularly noticeable as a study in English literature. It deals with Samuel Garth, a minor poet but a most notable one. A member of the Kit-Kat Club, Garth lived on terms of intimacy

with most of the distinguished men who made up the membership of that famous organization. Dr. Cushing writes a most delightful account of the only physician honored with membership in the heyday of the Club. Two of the papers deal with the Great War. Dr. Cushing went overseas and worked in the American Hospital at Neuilly before the United States entered the War. In May, 1915, he spent some time visiting the British hospitals and clearing stations in France and his description of them is vivid and interesting. The other war article is a tribute to the work of the New England Surgical Dressings Committee, an organization which prepared surgical supplies and sent them to the Allies during the War. There is a fine personal tribute to the late Sir William Osler, which was read before the Thursday Evening Club, shortly after his death. The remaining papers are addresses delivered before various medical bodies. They show the versatility as well as the ability of the author, and are written with his usual verve and delicacy of touch. The book is one to be heartily recommended as pleasant as well as profitable reading.

FRANCIS R. PACKARD.

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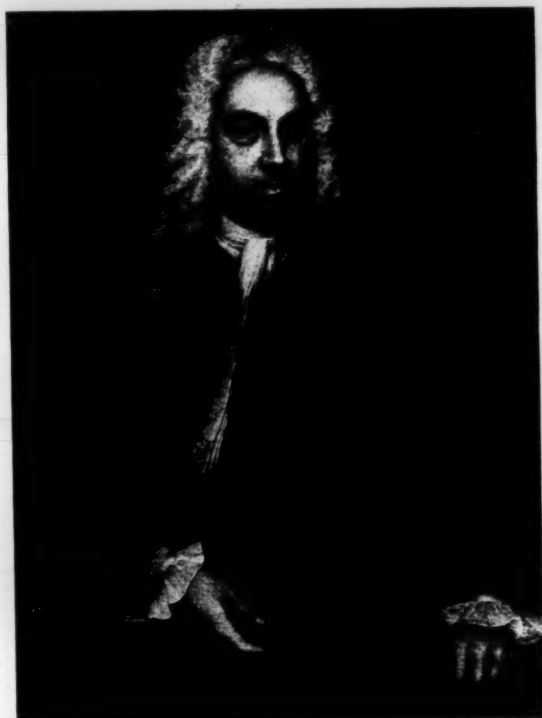


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WILLIAM OLIVER

[1695-1764]



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